Z88

User Manual

CAMBRIDGE COMPUTER

Z88 USER GUIDE

(ROM REL. NO. : A0003)

CONTENTS

INTRODUCTION	Section One – Getting started Introducing the Z88 Up and running The Z88 applications and popdowns Basic concepts	3 4 6 11 15
TUTORIAL	Section Two – Using PipeDream Starting PipeDream Designing a party invitation Compiling a name and address list Calculating home expenses	31 32 37 46 56
	Section Three - Using the Diary	65
	Section Four - Using the popdowns The Calculator - DR The Calendar - DC The Clock - DT The Alarm - DA The Filer - DF The Panel - DS Import/Export - DX The Index - NDEX	69 70 75 77 78 80 87 90 92
REFERENCE	Section Five - PipeDream reference Operations on blocks of slots - BLOCKS Moving about the document - CURSOR Editing text and expressions - EDIT Working with files - FILES Altering the document layout - LAYOUT Document options - OPTIONS Printing documents - PRINT Expression slots	103 104 114 118 125 131 138 146

	Section Six – The Diary reference Operations on a block of text – BLOCKS Moving around the Diary – CURSOR Editing the Diary – EDIT Loading and saving – FILES	161 162 166 170 172
	Section Seven – Filer reference	175
	Section Eight - The Terminal	185
	Section Nine - The Printer Editor	187
	Section Ten – BBC BASIC BASIC keywords BASIC operators	195 199 223
APPENDICES	Appendix A – Replacing batteries	229
	Appendix B - Serial port	231
	Appendix C – Error messages	233
	Appendix D – Z88 character set	237
	Appendix E - PipeDream file format	240
	Appendix F - Z88 specification	243
	Index	245

INTRODUCTION

3
4
6 6 7 8 8 9 9
11 11 13
15 18 18 19 20 20 23 24 24 24 24

Section One Getting started

Start here to find out how to get your Z88 working for you.

This section contains four introductory chapters:

Introducing the Z88 gives a foretaste of what the Z88 can do.

Up and running explains how to insert batteries, switch on, and start writing your first document on the Z88.

The Z88 applications and popdowns describes the programs provided in the Z88, to help you decide which you want to learn about first. These are then explained more fully in the later sections.

Basic concepts explains a little more about the components of the Z88: the keyboard, the display, and how the functions work.

Introducing the Z88

The Z88 is a unique computer for several reasons.

For the first time in a machine of its size and portability it offers you a powerful productivity tool, PipeDream, capable of tackling the most demanding applications and providing all the capabilities normally only obtained by working with separate programs on much larger computers; it combines in one program most facilities provided by the best word processors, database programs, and spreadsheets.

To complement PipeDream, the Z88 comes complete with a range of utility programs, designed to anticipate any task you might wish to perform in the home or office; these include a clock, calculator, diary and organiser, and an alarm reminder.

The Z88 also avoids the problems of storing documents and applications long-term by providing battery-powered circuitry which will retain all the information in the computer for over a year while it is switched off. The batteries also maintain the correct time and date in an internal clock and calendar.

In addition, communication with larger computers is catered for by builtin transfer programs.

In no time, the Z88 will revolutionise your life by making it possible for you to work with the tools you need, wherever and whenever you want.

Conventions in this manual

In this manual, anything displayed on the Z88 screen is shown in a computer typeface, such as

Name of file to save

Anything that you should type at the keyboard is shown in a different typeface to designate the keyboard keys; for example

You are invited to a party

The keys on the keyboard with a special function are shown in the text with key legends. So, for example, if you are asked to type

myfile ENTER

you would actually type the letters m y f i l e and then press the ENTER key.

In general, references to menu headings are in bold caps; for example LAYOUT

References to individual commands are in bold; for example Save or Load.

References to options displayed by a command are in italics; for example Save only range of columns.

Up and running

This section will explain how to get your Z88 working for you as soon as possible. Once you have tried out the simple examples in the next few pages you should have a feel for what the Z88 can do for you, before proceeding to the later sections at your leisure.

Fitting batteries

To run the Z88 you will need the following batteries:

• Four alkaline cells, Size AA, type MN1500 or LR6,

Other types of the same size can be used in an emergency, but we recommend the use of the leak-resistant alkaline type as these will keep your Z88 working for longer without needing replacement.

With these batteries an unexpanded Z88 will give about 20 hours of active computing, and the data will be preserved in the machine while it is switched off for up to a year.

For heavy indoor use the mains power unit is recommended.

Note that the procedure described here is not the same as the one for replacing existing batteries. In this case refer to Appendix A.

Inserting the batteries

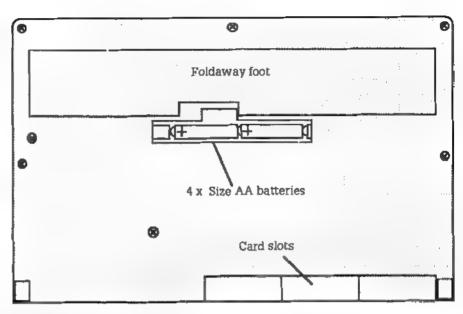
The four batteries are housed in a row in the battery compartment, under a flap on the rear of the Z88 case.

To insert batteries for the first time, use the following procedure:

① Remove the cover from the battery compartment on the back of the Z88 case, and insert one battery at each end of the compartment.

Make sure the batteries are fitted the correct way round, as indicated by the diagram in the battery compartment.

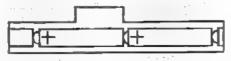


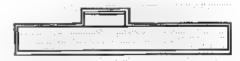


② Insert the remaining two batteries to make an 'A' shape above the case. Make sure that all four batteries are facing in the same direction, with the correct polarity.

Then push down on the two batteries so that they click into place.

③ Replace the battery compartment cover firmly.

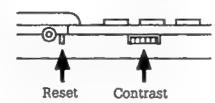


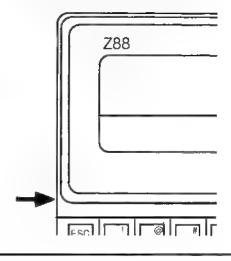


Initialise the Z88

- ① Open the transparent cover to the card slots.
- ② Locate the reset button, which is situated behind

 hole on the left-hand edge of the Z88 case.
- ③ Press the reset button twice, using an unbent paperclip to reach into the hole.
- ① Close the card slot cover. This gives a hard reset, initialising the Z88 to make it ready for use.



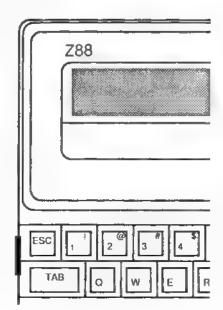


Adjust the display

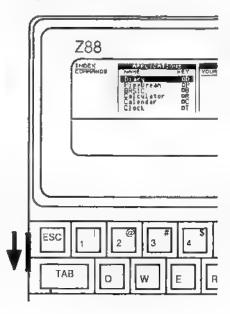
① Turn the contrast control as far towards the top of the Z88 case as it will go (ie clockwise).

Z88

② The screen should display a dark blue rectangle.



③ Gradually turn back the control until you can see the Z88 screen clearly.



Set the clock

When you first install batteries you will need to use the Clock popdown to set the correct date and time using the following procedure:

- ⊕ Press □T to enter the clock popdown.



③ Press ENTER to enter the Set function, which displays the previous (incorrect) date and time, and will allow you to alter these to their correct values:



You can move the cursor between the time and date with Ω and Ω .

You can also move the cursor left and right along the digits with the

☐ and ☐ keys. Moving off the end of the date will position the cursor on the time, and vice versa.

 Having positioned the cursor, simply type the correct time or date, using the numeric keys 0 to 9. The format of the new time and date should not change; if you type over the '/' or ':' signs, move the cursor back with the
 key and replace them.

When you have set the correct values, press ENTER to confirm them, and after about two seconds the correct time and date will be displayed.

Finally, press ESC to exit from the Clock.

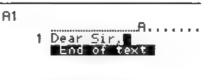
Try typing text

⊕ Hold down the □ key (at the bottom left of the keyboard) and press the P key, to enter PipeDream. ② Type Dear Sir, at the keyboard. Press the DEL key to delete mistakes. If you type more than will fit on one line, PipeDream will automatically lay out the text for you.

③ Return to the Index by pressing the MOEX key. Your letter will be kept as a suspended activity; go back to it by pressing □P again.

You are now ready to proceed with the examples of using the Z88 in the following sections.





Switch off

There is usually no need to worry about switching your Z88 off.

If you do not type anything for several minutes the machine will automatically switch off to conserve power. You should always switch your Z88 off before, for example, carrying it in a briefcase. This is because the keys may get pressed, disturbing what you were in the middle of doing, or keeping the Z88 on and wasting the batteries.

To switch off press both SHFT keys simultaneously.

To switch the Z88 on again at any time, press both SHIFT keys simultaneously.

The Z88 applications and popdowns

The Z88 comes with two types of built-in program, called **applications** and **popdowns**. For most of your work, you will probably use the **applications**, for writing text, setting up financial calculations, or organising information and appointments.

The popdowns perform simpler tasks, and are equivalent to desktop tools. They can be called up from within any application whenever you need them, and in the cases of the alarm clock, calculator and calendar, will generally be most useful for making a rapid check or record of information. So, in the middle of typing a letter, for example, you could use the Calculator to perform a quick calculation, and then return immediately to the letter.

You can keep several unfinished documents in your Z88 at once: when you return to one of them to continue working on it, everything will be exactly as you left it. The Z88 is designed to leave you free to do things in whatever order you wish, and whenever you want. It does the work, and leaves you free to get on with the thinking.

The next few pages will give an overview of what the Z88 applications and popdowns can do. The TUTORIAL, in Sections Two, Three, and Four, then gives fuller descriptions of each application and popdown, with examples of their use.

The applications

The following applications are provided in the Z88:

Creating documents - PipeDream

A typewriter may enable you to type in text, correct mistakes as you type them, and underline text, but as soon as you need to make revisions, you inevitably have to retype parts of what you have already written.

In **PipeDream** you can carry out proof corrections, sorting operations, and complex calculations with a few keystrokes, without you having to retype any of the text.

Some facilities, such as the ability to move blocks of text around, will be familiar to anyone who has already used another word processor. Other features, like the ability to put a list of items into numerical order or the ability to perform calculations on tables of values, are normally only found on specialist pieces of software specifically designed for these tasks.

Organising your time - Diary

The Diary program provides a quick way of organising events, and keeping day-to-day information, such as expenses. Like a desktop diary, there is a page for each day, on which you can write engagements and other information. But the Z88 diary also caters for the likelihood that you might want to find something you wrote down on a previous occasion; if you cannot remember even the month of a particular exhibition, just search for 'exhibition' and the Diary will find the page for you. You can also print out entries of a certain type, which makes it easy to produce expense claims, or worksheets.

Writing a program - BBC BASIC

The Z88 comes complete with the BBC BASIC programming language which will allow you to program the computer to carry out sequences of instructions. For example, if you wanted to process some complicated statistical data, or convert the format of a file, the simplest way to do this might be to write a program using BBC BASIC.

BBC BASIC is also an ideal language for learning to program, and many books on programming are available for use with it.

Talking to another computer - Terminal

The Terminal application allows you to set up a conversation with another computer, using the VT52 standard. With a modem, this will allow you to access information databases via a telephone line.

Create a printer driver - PrinterEd

The applications will print on any serial printer connected to the Z88, but to make full use of a particular printer's capabilities, such as special fonts and highlighting features, you may want to create your own driver selecting whichever features you require. The PrinterEd application makes this a simple task.

The popdowns

Popdowns are programs you can call from within an application, to perform a service without breaking off from what you are doing.

Managing resources - Index

The Index popdown is the key to all other Z88 applications and popdowns. From here you can call any other application or popdown, or resume an activity you suspended on a previous occasion. The Index also contains the Card Manager, which shows what memory cards or plug-in applications are present in the Z88, and allows you to insert or remove cards.

Performing rapid calculations - Calculator

You can use the Calculator to make quick calculations – even if you are in the middle of doing something else at the time. Its features include ten memories, and a units-conversion facility. So, for example, you can convert from litres to gallons with a few key-presses.

Looking up dates - Calendar

The Calendar means that you can plan your appointments for the coming weeks at a glance; and when you need to make a Diary entry, you can use the Calendar with the Diary to find the day you want immediately (see p. 68 for details).

Knowing the time - Clock

The Clock will show you the time and date instantly, without your having to look away from whatever else you are doing.

All files and suspended activities are labelled with the time and date, so be sure that you have set the clock before you use the Z88.

Remembering appointments – Alarm

The Alarm application allows you to set up a number of alarm reminders, with a given time and, if required, date. Each reminder can include a message, and reminders can be programmed to alert you at the same time every day, month, or other interval. You can even set the alarm to run a program.

Working with files - Filer

The Filer gives you access to the Z88 filing system, where you can store documents and BBC BASIC programs in the Z88 RAM, or for more permanent storage on an EPROM card. Although the filing system supports a flexible hierarchical directory structure, for simple applications directories can be ignored.

Customise the Z88 - Panel

The Panel is a set of controls for the Z88, allowing you to tailor the way that the keyboard, filing system, sound, and serial interface work to your own preferences.

Transferring files to another computer - Import/Export

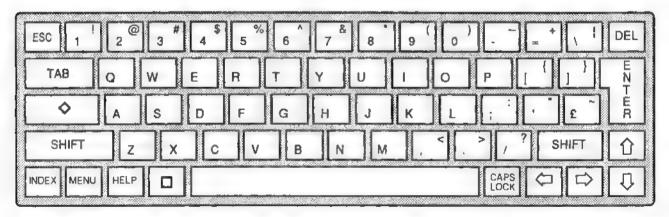
The Import/Export popdown enables you to transfer documents to or from another computer, using a simple set of commands.

Basic concepts

Before trying an application on the Z88, you need to be familiar with the basic concepts which are common to all applications. These involve selecting what you want to do, be it running an application or performing an operation within an application, and then carrying it out with the appropriate command from the keyboard.

The keyboard

The Z88 keyboard looks like a normal typewriter keyboard with the familiar *gwerty* arrangement of letters.



There are some additional keys on each side of the keyboard which have the special functions explained below.

The letter and number keys

Press the letter keys alone to give the lower-case letters, or with SHIFT to get capitals. You can get capitals without needing to hold down SHIFT by pressing CAPSLOCK – see below.

Press the digit keys on the top row of the keyboard to give the digits, or with SHFT to give the symbol above each digit on the key.

Note that, unlike on some typewriters, the letter O is quite different in meaning from the digit 0, and the letter I (lower-case L) from the digit 1.

On the left-hand side of the keyboard:

- will normally cancel what you are currently doing, and go back to the most appropriate point just before.
- is like the tabulate key on a typewriter. Use it for making columns of figures, or arranging tables.
- enables you to select which of the Z88's operations you want to carry out. These are explained in greater detail in the section **Using menus** on p. 20.
- will return you to the Index from within an application.
- gives you a display of information about the action you are currently carrying out. Further information is then available on related topics.
 - introduces a short cut to calling an application or a popdown.
 - introduces a short cut for carrying out an operation within an application or popdewr. A list of the most useful of these operations is given on the Single key functions card, above the Z88 keyboard.

On the right-hand side of the keyboard:

- nubs out the last character you typed at the keyboard.
- is normally typed at the end of a line to confirm what you have just typed, or to go to the beginning of the next line, like the carriage return on a typewriter.
- $\bigcirc, \bigcirc, \bigcirc, \bigcirc$ move the cursor up, down, left or right on the screen.

Caps lock modes

Two caps lock modes are available which determine the way that the SHET key operates. The mode selected is indicated by a symbol at the bottom right-hand corner of the screen. The state of the caps lock mode is stored with each application, so you can, for example, keep one mode set up for PipeDream and another for BASIC. The operation of each mode is as follows:

♦ CAPSLOCK

selects Normal Caps mode. The letter keys give capitals, irrespective of the $\overline{\text{SHET}}$ key. Displays:

CRP5

CAPSLOCK

selects Inverted Caps mode, giving capital letters normally, and lower-case with the $\boxed{\text{SHIFT}}$ key. Displays:

caps

CAPSLOCK

switches on and off the selected mode.

Special characters

♦' gives '`' (grave accent), and ♦SPACE gives an exact space, displayed as '...'.

Cleaning the keyboard

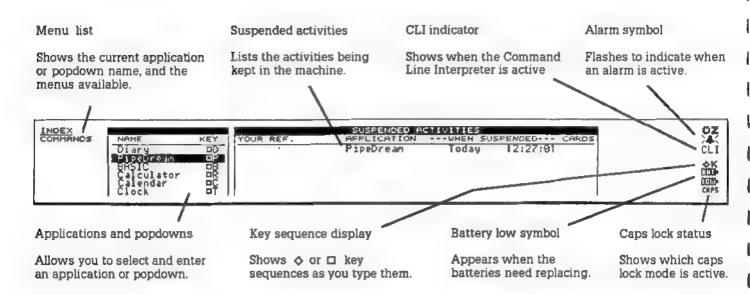
The keyboard should be kept free from dust by cleaning it periodically with a damp lint-free cloth, or sponge. Solvents should not be used.

The Index

The Index popdown allows you to call up Z88 applications or popdowns, or to return to any activity that you were previously working on.

To see the Index screen at any time, press the NDEX key at the lower left of the keyboard. To return to an application from the Index, press ESC.

The components of the Index screen are identified below:



The right-hand edge of the screen is reserved for status information from the Z88 operating system. It displays OZ when the Z88 is ready for use.

Entering an application

To enter an application, or a popdown, you simply have to select its name on the APPLICATIONS menu by moving the highlighting bar up and down with the cursor keys Ω and Ω :

 \Box D Diary $\Box P$ **PipeDream** $\square R$ BASIC $\square R$ Calculator Calendar $\Box C$ Clock OT Alarm ПΑ Filer OF PrinterEd. DΕ Panel DV Terminal Imp-Export $\square X$

When the bar reaches the bottom of the screen, the list scrolls up to show the remaining options. Having selected the one you want press the [ENTER] key to enter it.

Creating a new activity

Entering PipeDream or BBC BASIC from the Index APPLICATIONS list creates a new, blank document.

For example, to enter PipeDream, starting with a new blank document, move the highlighting bar until PipeDream is selected, and press the ENTER key; you will then see the PipeDream screen:

PIPEOREAM A1
BUCKS
CURSOR
EDIT
FILES
LAYOUT
OPTIONS
PRINT

Suspended activities

If you return to the Index after creating a document in PipeDream (or writing a program in BBC BASIC), your activity will be suspended, and you will see it listed in the list of SUSPENDED ACTIVITIES. This shows the time and date you were last working on the document under the heading WHEN SUSPENDED, and if a name has been given to the document (with the PipeDream OFC or OFL commands, or the BASIC *NAME command), the name will be shown in the column headed YOUR REF. You can keep as many PipeDream and BBC BASIC suspended activities as you want, subject to the available memory.

Re-entering a suspended activity

You can re-enter a suspended activity by selecting it on the list of SUSPENDED ACTIVITIES. Move the highlighting bar across with the □ key if necessary, and then press the ENTER key. Alternatively, pressing □P or □B repeatedly will enter each PipeDream or BBC BASIC activity in turn.

Killing activities - OKILL

Each suspended activity does, of course, use up some memory space; some for the document you are working on, plus a small overhead needed by the application. You can therefore kill activities you no longer need to work on in order to free the memory space. Save the document (or program) first if you may need it again.

To kill a suspended activity, select it on the SUSPENDED ACTIVITIES list with the cursor, and type \diamond KILL. The activity will be removed from the list, and any document (or program) associated with it will be lost.

Using menus

The Z88 applications, and some popdowns, use menus to show you what operations are available at any stage, and to give you a simple way of choosing the one you want from among them. In keeping with the philosophy of the Z88, menus free you from having to remember cryptic sequences of commands to be typed from the keyboard, and allow you to do what you want as quickly as possible.

The items on each menu all relate to one particular type of operation. For example, all the operations to do with printing are listed on a **PRINT** menu. The menu headings are shown on the Menu List, which is displayed on the left-hand side of the screen under the name of the application or popdown.

To use menus you have to:

- ① Select the menu you want from the menu list.
- Select the operation you want to perform from that menu.
- ③ Execute the operation.

These three steps are now explained in greater detail.

Selecting a menu

As an example of using menus, try using the menus in the PipeDream application. First enter PipeDream from the Index as already described.

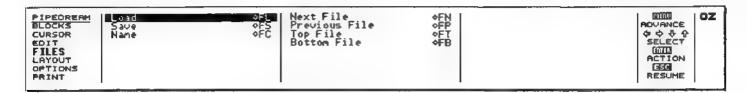
The menus available in any application are listed at the left-hand side of the screen, under the application name.

For example, the menus in PipeDream are given under the heading PIPEDREAM. Each title refers to one type of operation you can perform with PipeDream. For example, the first menu, the BLOCKS menu, contains operations you can perform on a block of text.

Pressing the MENU key will display this menu, and BLOCKS will be highlighted in bold letters on the Menu List. To look at a menu further down the list, press the MENU key until you reach it. If you go past the menu you want, keep pressing the MENU key until it circles back around to the top of the list.



For example, to select the FILES menu, you need to press the MENU key three more times. You can always check which menu is displayed by the title in bold on the Menu List.



Selecting an operation

You select a menu item by moving the highlighting bar with the cursor keys $\Leftrightarrow \lozenge \circlearrowleft 0$ until the operation you want is highlighted.

Executing the operation

To perform the highlighted operation, simply press the ENTER key.

For example, on the BLOCKS menu example shown above, press the ENTER key to perform the Mark Block operation.

Options

Many operations give you a list of options before actually carrying out the command. The Save command, on the FILES menu, is an example; press \bigcirc to highlight the Save command. When you press the ENTER key you will see the following prompts:

Name	of file to save	
Save	only range of columns	No
Save	selection of rows	No
Save	marked block	Ho
Save	plain text	Но

In this case you can simply type in a file name, such as

Name of file to save Myfile∎

and press the ENTER key to carry out the Save.

The other options under the **Save** command have only two possibilities each, Yes and No. You can alternate between them in two different ways:

- ① Type Y for Yes and ¶ for No as appropriate.
- ② Use the Next Option or ◇J command to display the alternative value. (With options which have specific values, ◇J will restore the default; see Setting the options, p. 103, for more details.)

Escaping from an operation

If you decide against performing an operation from the menu, press the ESC key and the menu will disappear from the screen.

It may take you a little while to become familiar with using the menu operations to carry out your wishes, but once you have mastered menus you will be able to use all of the applications on the Z88 without difficulty.

Short cuts - •

Menus make it easy to locate what you want to do even if you are not familiar with an application. But with a little experience you will find you know exactly which operation you want to carry out, and so will appreciate the short cuts which allow you to carry out any action without going through a menu.

Each operation can be called up by typing the special \diamond key (called 'diamond'), followed by a sequence of one or more letters. When you type a \diamond sequence, the operation will be carried out instantly, no matter what you were doing in the application. If you do not keep the \diamond key held down while you are entering a \diamond sequence, the letters are shown at the right-hand side of the screen as a reminder.

The short cuts are shown on each menu so that you can refer to them if necessary. For example, the short cut for the **Save** operation, shown on the **FILES** menu above, is \diamond FS. Also, the most useful of these operations are shown on the list of key functions above the Z88 keyboard.

Note: Normally ♦ and □ may be used either by holding them down whilst typing the sequence, or by pressing and releasing them and then typing the sequence. There are two exceptions to this; these are ♦ESC and □ESC where they must be held down.

Line editing

In most situations where you are entering a line of text in the Z88, such as in response to a prompt, the following commands are available to make corrections and alterations to what you are typing:

- ♦
 ♦

 moves the cursor to the beginning or end of a line

deletes the previous character

SHIFT DEL deletes the character at the cursor position

♦D deletes to the end of the line

♦T deletes a word

Memory low condition

When you have almost filled the Z88 memory, with applications or data, the menu-selection of commands is automatically disabled to conserve memory. The highlight bar disappears, and the prompt display, at the right-hand side of all menu screens, changes to indicate that menu commands can no longer be selected with the cursor keys:



In the memory-low condition the command short cuts must be used until enough memory has been freed from the machine.

Soft and hard reset

Soft reset

In the unlikely situation of the Z88 not responding to any keyboard input it can be given a soft reset. This will remove all the applications running in the Z88, and clear any temporary work space being used by the operating system, but should retain all files.

To give a soft reset, press the reset button twice. The display will briefly show

SOFT RESET ...

and then return to the Index. The operating system does its best to retain all files in the internal or external memory, and usually succeeds.

Hard reset

Hard reset completely initialises the Z88, clearing all memory, losing all files, and resetting the clock. Hard reset is described in Initialise the Z88, p. 8. After a hard reset the Z88 will display

HARD RESET ...

Help

The Z88 contains a Help system with highly-structured information on many operations and facilities provided by the machine. The problem new users of a computer often face is that they need to find out how to do something but are not quite sure where to look. The Z88 Help system overcomes this problem by allowing you to 'browse', from Help information on one topic to information on related ones which might also provide the information you require. The help information is limited on the basic machine, but there is the provision of extending it with a Help application card.

Getting help

To find out information about a particular topic all you have to do is press the Help key at the bottom left-hand side of the keyboard. The Help system will then automatically give you information on the menu or operation within the application you are currently using.

Browsing within Help

Returning to your application

To exit from the Help system and return to your application, press the |ESC| key.

TUTORIAL

Section Two - Using PipeDream	31
Starting PipeDream The structure of PipeDream	32 33
Designing a party invitation Starting PipeDream Typing text Deleting Word wrap Adding text Starting a new paragraph Columns Replacing text Inserting a line Adding styles to text Altering the layout of text Saving your document Loading a document Printing the document What next?	37 37 38 38 39 40 40 41 41 42 43 44 44
Compiling a name and address list Preparing the document Setting up headings Entering some information Saving the document Sorting the information Finding information Help with searching Printing selected rows	46 46 47 48 50 50 52 53 53

Calculating home expenses Designing the table Moving around the document Labelling the table Entering the rates Referring to slots Replicating values Other expenses Monthly totals Replicating slot references Percentage expenditures Changing the format What you have learnt	56 56 56 57 58 58 59 60 60 61 63 64
Section Three – Using the Diary Entering the Diary Making a Diary entry Moving between days Searching for Diary entries Using the Calendar and Diary together	65 65 66 66 67 68
Section Four - Using the popdowns Using popdowns	69
The Calculator - □R Entering numbers Display format Constants Storing and Recalling Percentages Converting units	70 71 72 72 72 73 74
The Calendar - □C Searching for a day Active days	75 76 76
The Clock - □T	77
The Alarm - □A Alarm options Clearing alarms	78 78 79

The Filer - DF Entering the Filer File names Giving Filer commands Selecting files Filer commands	80 81 81 82 83 84
The Panel - DS Altering the panel Panel options	87 87 87
Import/Export - DX Using Import/Export Import/Export protocol	90 90 91
The Index - DI The Index screen Entering an application Suspended activities Cards RAM cards EPROM cards Application cards	92 92 93 93 94 95 96 98

Section Two Using PipeDream

This section will familiarise you with all the essential facilities provided by PipeDream, through a series of three simple worked examples:

- Design a party invitation, using PipeDream's text editing and page layout facilities.
- Set up a name and address list, using PipeDream's ability to organise information.
- Calculate home expenses, using PipeDream's facilities for working with tables of figures.

Starting PipeDream

Before trying the sample applications using PipeDream, this section shows how to start PipeDream, and introduces the fundamental concepts necessary to an understanding of how to work with it.

First start PipeDream with a blank document from the Index. To do this:

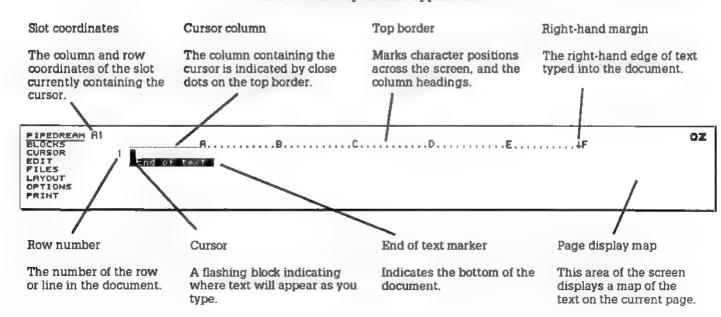
- ① If you are not already in the Index, press the NOEX key.
- ② Select PipeDream from the Index APPLICATIONS list. Press

 to move into the APPLICATIONS list, if necessary, and press

 or

 until PipeDre am is shown highlighted.
- Tress the ENTER key to enter PipeDream.

You will see the PipeDream opening screen, confirming that you have selected the PipeDream application.

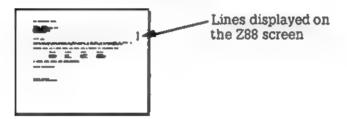


For clarity, the subsequent diagrams in this chapter show the central portion of the screen only.

Page display map

The page display map gives you an overall view of the current page of the document you are working on in PipeDream. Each character in the document is represented by a single dot in the map, enabling you to see the layout of the whole page and, if necessary, to adjust the layout to improve the appearance.

At any time the lines on the map corresponding to those displayed on the PipeDream screen are indicated by a vertical bar at the right-hand side of the map:



The structure of PipeDream

To make best use of PipeDream it is important to understand some basic principles of how PipeDream documents are constructed.

Rows and columns

Every document is divided into rows or lines, numbered 1, 2, 3... etc, and one or more columns, labelled with letters A, B, C... etc. Initially the document has 6 columns, labelled A to F, each of which is 12 characters wide, but commands are available for you to alter the widths of individual columns or to alter the number of columns.

The part of a document lying in one row and one column is called a slot. A slot is referred to by its column label and its row number; for example, the following diagram shows slot D3 highlighted by the highlighting bar:



The coordinates of the slot containing the cursor are shown at the top left of the PipeDream screen, and the column containing the cursor is identified by closely-spaced dots on the top border.

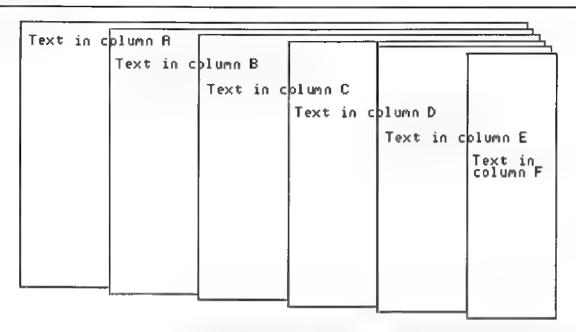
The right-hand margin is indicated by the \$\psi\$ symbol on the top border, and normally all columns have their right-hand margins at the right-hand edge of the screen.

Much of the power and flexibility of PipeDream comes from the two different types of slot which you can create and combine within a single document: text slots and expression slots. Each type of slot can contain up to 240 characters.

Text slots

Text slots are used for entering and editing continuous text, such as the body of a letter, a technical paper, or a novel.

When working with text, the columns in PipeDream behave as if they are on different layers, like separate overlapping sheets of paper. For example, the initial column format could be represented by the following diagram:



Text typed into column A behaves as if it is on the bottom layer, which is 72 characters wide; it will 'show through' the other layers, unless they contain text or expressions in the same row.

Text typed into column F behaves as if it is on the uppermost layer, which is only 12 characters wide

When text is typed into a text slot it will automatically wrap around to the start of the next row in the same column when the cursor reaches the right-hand margin for that column (unless wrapping has specifically been turned off).

Formatting

If justified text has been selected, from the Options Page, lines will be padded with spaces so that the right-hand margin is even. The layout of a document can be altered simply by moving the right-hand margin, and then reformatting the text paragraph by paragraph.

By giving each column a different right-hand margin, independent columns of text can be created within the same document. With a little practise you will find that PipeDream is capable of creating quite complex multi-column page layouts.

Expression slots

Expression slots, on the other hand, are used for creating tables of figures or information, often called spreadsheets. These can contain mathematical expressions, including references to other slots in the document, and scientific functions.

The main difference between expression slots and text slots is that once you have typed the expression into an expression slot, what is displayed in the document is not the expression itself, but the result of evaluating the expression. For example, if you typed 1.15×300 into an expression slot, the result 345 would be displayed in the document.

For spreadsheet work you can make all slots work as expression slots by default by setting the Options Page Text/Numbers setting to Numbers; see p. 140.

Mixing text and expressions

Text slots and expression slots can be mixed in the same document; so a letter could include a table of financial calculations automatically added together by PipeDream, or a company business plan could incorporate a spreadsheet within the descriptive text to show financial predictions.

Values from expression slots can be included within formatted text in text slots using '@-fields'. This is convenient if, for example, you want a letter to refer to the result of a particular calculation.

The examples

The concepts of rows and columns, text slots and expression slots, and formatting text, are illustrated by the following three practical examples in the use of PipeDream.

Designing a party invitation

This chapter will explain how to:

- Type in text
- Make corrections to the text you have entered
- Create bold and underlined text
- Alter the layout of text
- Save the document
- Print the document

Starting PipeDream

This example shows how PipeDream can be used in a typical word-processing application. To enter PipeDream from the Index starting with a blank document, select PipeDream from the Index, and press the ENTER key.

Typing text

Type the following:

You are invited to a beano.

Notice that the cursor moves to the right as you type. The next character you type will always be typed at the position indicated by the cursor.

A short time after you stop typing, you will see the page map, on the right-hand side of the screen, change to show the new layout of text on your page.

Deleting

Press the DEL key at the top right-hand side of the keyboard, until the word beano disappears.

DEL backspaces the cursor over the text you have typed, removing it from the page.

Word wrap

Type the word party and then continue to type the paragraph shown below. If you make a mistake, use the DEL key to correct it.

When your typing reaches the right-hand margin, indicated by the ↓ symbol on the top border, just keep typing and PipeDream will automatically carry words over to the start of the next line.

You are invited to a party to celebrate the creation of my first document with the Z88 computer. Champagne will be provided.

Adding text

PipeDream starts in Insert mode, although you also have the option of working in another mode called Overtype mode. You can change modes with the Insert/Overtype command; see p. 119.

In Insert mode, text is always added at the position indicated by the cursor. You can add text simply by moving the cursor to the point where you want the text added, and then typing. The cursor is moved around on your document using the four arrow keys, $\langle \neg \rangle$, $\langle \neg \rangle$, $\langle \neg \rangle$, $\langle \neg \rangle$ at the bottom right-hand side of the keyboard.

Position the cursor after the word champagne, on the second line of the text you have just entered, press the space bar, and add the phrase:

and smoked salmon

The original text will move apart to make room for the new text, and words will wrap around to the next line at the right-hand margin to ensure that the altered text is correctly formatted.

```
A.....B.....C.....D.....E......F

1 You are invited to a party to celebrate the creation of my first
2 document with the Z88 computer. Champagne and smoked salmon Mill be
3 provided.

End of text
```

Starting a new paragraph

After adding the new text press the ENTER key. ENTER moves the cursor to the beginning of the next line.

Press ENTER twice more to leave a blank line and move the cursor down to row 5 on the page. Type the following:

Sunday 28th February at 12 o'clock.

You can use the ENTER key to end paragraphs, insert blank lines, and separate items in a list.

```
1 You are invited to a party to celebrate the creation of my first 2 document with the Z88 computer. Champagne and smoked salmon will be 3 provided.

5 Sunday 28th February at 12 o'clock.
```

Columns

The page you are working on is divided into six columns, each 12 characters wide, shown by the rows of dots and the letters A to F on the top border of the screen. These provide the equivalent to tab positions on a typewriter.

With the cursor still on row 5, press TAB exactly five times. The cursor will move to the left-hand edge of each column in turn until it reaches the left-hand side of the column labelled 'F'. Notice that as the cursor moves into each blank slot, text overlapping the slot is hidden. Now type in the text:

RSVP

The text will be positioned near the right-hand side of the sheet, opposite the text already on row 5.

F5

1 You are invited to a party to celebrate the creation of my first
2 document with the Z88 computer. Champagne and smoked salmon will be
3 provided.

5 Sunday 28th February at 12 o'clock.

RSUP

You can move to the previous tab position by holding down the SHFT key and pressing [TAB]. Try doing this to move the cursor back into column A, at the left-hand side of the screen.

Replacing text

You can remove characters from the middle of a line by using the **Delete Character** command which you can give either using the **EDIT** menu, or
by holding down the **SHET** key and pressing **DEL**.

Now you decide to change the day of the party to Saturday 28th February. Move the cursor across to the 5 of Sunday with the cursor keys. Then, hold down the SHFT key and press DEL; the 5 will be deleted. Keep pressing SHFT DEL until the word Sunday is removed. Then, type in the word Saturday to replace it.

Inserting a line

Now add a heading to the invitation. To do this, you first need to insert two blank lines at the top of the page.

Move the cursor up to the first line of your document, row 1, by pressing $\hat{\mathbf{Q}}$.

Now give the **Insert Row** command. You can do this either using the **EDIT** menu, or by typing $\diamond N$. A blank line will be added where the cursor was, and the remaining lines of the document will be moved down on the page.

Type $\diamond N$ again to give two blank lines at the top of the page. Then type in the following text:

A Once-in-a-lifetime Party

A Concering A computer of the creation of my first document with the Z88 computer. Champagne and smoked salmon will be provided.

The bottom line of your document will not be visible as it is off the bottom of the screen. You can make it scroll into view by moving the cursor down with the 0 key. Move the cursor back to the top line with the 0 key before continuing with the example.

Adding styles to text

You can emphasise key phrases in your text by changing the style to bold, underlined or italics. This is achieved by selecting one of the highlight commands from the **PRINT** menu, or by typing one of the following highlight commands:

Command	Effect	Highlight code
♦PU	for underlined text	1
♦PB	for bold text	2
♦PI	for italic text	4

Type the command once at the beginning of the text you want to emphasise, and give the same command at the end of the text you want to emphasise, to switch back to normal text.

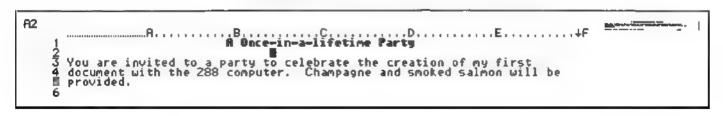
To emphasise the heading of the invitation, move the cursor to the beginning of the heading with the \bigcirc key. Then type \diamond PB. A '2' symbol will be inserted before the text to indicate that \blacksquare highlight code 2 has been inserted. Move to the end of the heading with the \square key, and type \diamond PB again. Another '2' symbol will be inserted. Now move the cursor down to the next line with the \square key and the heading will be displayed bold on the screen.

When you move the cursor onto the line containing highlights, the codes are displayed as highlighted numbers II to II so that you can edit them, or delete them, just like any other text characters. When you move the cursor onto another line, the effect of each highlight is shown on the screen, just as it will appear when printed out. (Italic text is displayed as tiny characters.)

Altering the layout of text

You can alter the layout of one or more lines of text in your document with one of the Align commands on the LAYOUT menu. For example, to centre a line of text, you move the cursor onto that line and then select the Centre Align command from the LAYOUT menu. Alternatively, you can type \$\delta LAC\$.

Move the cursor onto the line containing the heading of the party invitation, if it is not there already, and type \diamond LAC. You will see the heading become centred on the page map (which always shows you the format of the page as it will appear when printed). The actual line of text will be centred on the document when you move the cursor onto the next line.



Saving your document

Once you have finished working on a document it is a good idea to save it as a file to the Z88 RAM. You will then be able to find it again without difficulty at a later date, and there is the added advantage that documents saved to the filing system take up less space and are more secure than documents left within PipeDream.

You can save a copy of your document into the Z88 filing system by selecting **Save** from the **FILES** menu:

- 1 Press the MENU key until the FILES menu is displayed on the screen.
- Press the \$\frac{1}{2}\$ key to highlight the Save command.
- Tess ENTER to select the Save command.

The Save command optionally allows you to save only part of your document, and therefore prompts with the following questions:

Name	of file to save	
Save	only range of columns	No
Save	selection of rows	No
Save	marked block	No
Save	plain text	No

Type in the name Invitation as the name of the file to be saved, so that the top prompt becomes

Name of file to save Invitation∎

and press ENTER, since on this occasion you do not need to select any of the other options.

A copy of the document will be saved with the name Invitation in the Z88 filing system. You will see the file Invitation listed if you select the Filer by typing DF. Press SC to return to PipeDream.

If at some stage you expand the Z88 with a RAM card, you can save a document to the extra RAM by referring to it in the file name as, for example:

:RAM.1/Invitation

Loading a document

Try loading back the document you have just saved using the PipeDream Load command.

First clear the invitation from PipeDream by giving the **New** command from the **BLOCKS** menu. If you have altered the document since you saved it, the prompt

Overwrite text?

will be displayed at the top of the display, to give you the chance to go back and save your changes. Press Y to clear the document.

Then select the **Load** command from the **FILES** menu. As in the case of the **Save** command, fill in the file name in the list of options

Name of file to load

Invitation

and press $\[\]$ to load the file. You should see the invitation exactly as you saved it.

Printing the document

If you have a printer connected to the Z88, you can print out a copy of the invitation with the following procedure:

- ① Select the **PRINT** menu by pressing the **MENU** key until **PRINT** is highlighted on the Menu List.
- The Print operation may already be highlighted as it is the first item on the menu; otherwise use the cursor keys to select it.
- Press ENTER to give the Print command.
- Press ENTER again to ignore the Print options and print the invitation.

You can repeat the procedure to print as many copies as you want.

A Once-in-a-lifetime Party

You are invited to a party to celebrate the creation of my first document with the Z88 computer. Champagne and smoked salmon will be provided.

Saturday 28th February at 12 o'clock

RSVP

To get bold and underlined text to print correctly you may need to use the Printer Editor; see Section Nine - The Printer Editor, p. 187.

What next?

You have just seen how the Z88 makes it a simple matter to write text, correct mistakes, alter the layout, and print a document.

The Z88 also enables you to compile a catalogue of information, as demonstrated in the next worked example.

Compiling a name and address list

This example shows how you can enter any type of information such as a library catalogue, a book index or bibliography, or a name and address list into the Z88 using PipeDream.

You will learn how to:

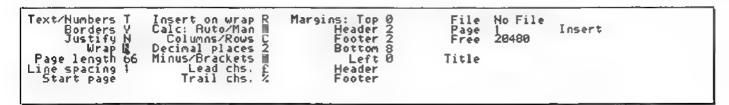
- Enter information
- Find any particular information you want
- Organise the information
- Print out all, or a selection, of the information in an orderly table

Preparing the document

Because you are going to enter lists of information, rather than a block of text for formatting into a document, you should first alter the *Wrap* option on the **Options Page** so that words do not wrap around onto the next line when they reach the right-hand margin.

Select the **Options Page** by typing \diamond O. You will see a display showing the different options you can select for your document, and information about the document.

Move the cursor down to the wrap option by pressing \mathbb{Q} until the cursor is opposite the word $\mathbb{W} r ap$. Then type N to change the option value from Y (Yes) to N (No) to stop wrapping altogether:



Setting up headings

Before entering information into PipeDream, it is good practice to set up headings to specify how the information will be arranged. Since you are going to create a name and address list, the headings will simply correspond to the name and address, with one reserved for additional information.

When you start a new sheet in PipeDream you are given six columns, each 12 characters wide. Although you can enter lines of text much wider than this in each column, it will make working with the name and address information simpler if, at this point, you make each of the columns in the document wider. You do this with the Width command in the LAYOUT menu.

Press the MENU key until the LAYOUT menu is displayed. The Width command may already be highlighted as it is the first item on the menu; otherwise use the cursor keys to highlight it. Then press ENTER to select it. In reply to the prompt

New width

type

24

and press ENTER to carry out the change. (You can ignore the other prompt - Specify column.)

The width of the column containing the cursor, column A, will increase to 24 characters.

Now move the cursor into column B by pressing the $\overline{\text{1AB}}$ key, and repeat the procedure to set the width of column B to 24 also. You can, if you wish, select the Width command directly without going through the **LAYOUT** menu, by typing \diamond W.

Continue until you have set each of the columns A to F to a width of 24 characters. Notice that when you press the [TAB] key to get from column C to column D, the document moves to the left on the screen so that columns D and E come into view without the cursor position changing.

Then move the cursor back to the left-hand side of column A by typing $\Phi(TAB)$.

Type the following headings, pressing the TAB key between each heading to move the cursor to the beginning of the next column.

Name TAB
Address TAB
Town TAB
County TAB
Postcode TAB

Notice that when you type the word Town and press the TAB key, the document scrolls to the left so that the column headed 'D' comes clearly into view:

1 Address Town
End of text

So, although you can only see three of the six columns in your document at any one time, it is a simple matter to move about and find the information you want.

Although it should be quite obvious what you will be using each of the first five headings for, you may be wondering what the purpose of the last heading I of o might be. You can use this to record additional information about all of the people in your address list, such as whether you sent them a Christmas card last year, when their birthday is, or any other information you would like to be able to recall. In the following examples the field will contain the person's age.

Entering some information

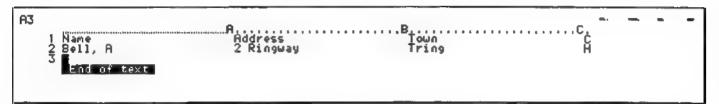
Move the cursor back to the left-hand side of column A by typing \$\tab{TAB}\$. Press the ENTER key to move the cursor to row 2.

You can now type the first name into slot A2.

Bell, A

Press the TAB key when you have finished typing the name to move the cursor across to the address column, column B. Type in the address, remembering to press the TAB key between each item:

Bell, A TAB 2 Ringway TAB Tring TAB Herts TAB TEl 2LM TAB 24



Enter the other names and addresses given below on lines 3, 4, 5, and 6 of your document in exactly the same way. Of course, if you prefer, you can compile your own list. If part of an address is too long to fit within one column, just keep typing; although you will not be able to see all the information in that column, it will be retained and you will be able to refer to it later.

Also, be sure to keep to the headings at the top of the document. For example, if a particular address does not have anything corresponding to a county, leave that column blank so that you put the postcode under the correct heading. This will enable you to search for a particular postcode, as described later.

Complete the table as follows:

Name	Address	Town	County	Postcode	Info
Bell, A	2 Ringway	Tring	Herts	TE1 2LM	24
Long, C	9 Knott Close	Farnham	Surrey	WAY 2GO	27
Rover, A	4 Chase Mews	Kenilworth	Warw.	K9 WUF	12
Bird, J	27 Wood Lane	Bath	Avon	CB1 L23	14
Hill, Max	10 Upper Street	Steep	Hants	UP 2IT	43

Saving the document

Since by now you may have spent some time entering information into your document, it is a good idea to save a copy to the Z88 filing system in case you accidentally lose the information during the next experiments. You save a copy of the document by using the same procedure as the one used for the party invitation.

Select the Save command by pressing the $\overline{\text{MENU}}$ key until the FILES menu is displayed. Press the $\overline{\mathbb{Q}}$ key to highlight Save. Then press $\overline{\text{ENTER}}$ to give the Save command.

Type addresses as the name of file to save, ignoring the other options since you want to save the whole document, and press ENTER. A copy of the document will now be saved to the filing system.

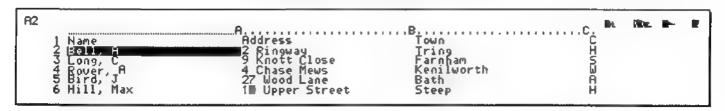
Sorting the information

Now that you have entered a table of names and addresses, it would be useful to have them sorted into alphabetical order so that you can look up a particular name more easily.

First you need to specify which part of your document you want to sort. Move the cursor to slot A2, the top left-hand comer of the table of names and addresses, using the 1 and 2 keys to move up and down the document and the TAB and SHIFT TAB commands to move across the document between columns to the left and right.

Mark slot A2 by giving the Mark Block command from the BLOCKS menu, or by typing $\Diamond Z$.

When you give the command, slot A2 will be highlighted on the screen to indicate that it has been marked:



Now mark the bottom right-hand corner of the table of names and addresses. Move the cursor down to row 6 and across to column F with the $\sqrt[4]{}$ key and the TAB command. Then give the Mark Block command again. When you have completed the second Mark Block command, the

entire table of names and addresses will be selected and shown highlighted on the screen.



The highlighted table of slots is referred to as \blacksquare 'block', and several commands are available which will operate on an entire block of slots that you have selected.

Move back to the left-hand side of the sheet with ♦ TAB.

To sort the block of slots, use the Sort command from the BLOCKS menu. Press the $\overline{\mathbb{N}}$ key until the BLOCKS menu is displayed. Then press the $\overline{\mathbb{Q}}$ key until the Sort command is highlighted on the menu, and press $\overline{\mathbb{N}}$ to select the command.

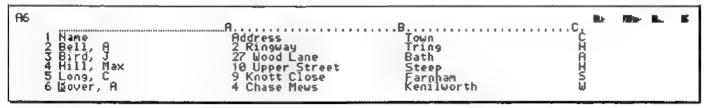
We wish to sort the names and addresses into alphabetical order of the names, which are in column A, so type A to the prompt

Sort on column

A

and press the $\boxed{\text{ENTER}}$ key to perform the sort. (You can ignore the other prompts for the moment.)

You will see that the names and addresses have been correctly sorted within the table. You can clear the marked block by giving the Clear Mark command from the BLOCKS menu, or by pressing ⋄Q:



You could, of course, have sorted the information on a different heading by specifying another column, rather than column A, when you gave the **Sort** command. For example, you may like to experiment with sorting the same names and addresses on the Town column, or on the column containing the peoples' ages.

Finding information

You could have entered many more names and addresses than the few you have already stored without running out of space in the document.

You can see how much space is available in a document at any time by typing OO to display the Options Page. The number of characters of space available is given after the heading Free on the right-hand side of the Options Page display. Press SSC to return to your document.

In a large list of names and addresses, it would be very inconvenient to have to search around in the list for a particular name or address. Fortunately, there is a much faster way, using the automatic search facility built into PipeDream.

Select the Search command from the BLOCKS menu in the usual way: display the BLOCKS menu with the MENU key, and use the cursor keys to highlight Search; then press ENTER to give the Search command.

The Search command displays a number of options which allow you to specify exactly what you want to search for, and whether you want to restrict the search to a particular part of your table of information.

For example, you might want to search for the address of someone whose surname you had forgotten, but whose Christian name you knew to be Max. You would then enter Max against the first option:

String to search for

Max

Press \mathbb{Q} to move to the next option which initially shows:

Search only range of columns

No

and press Y to alter the option value to Yes, and type A, to specify that you want to search only column A, which contains the names. The option will now read:

Search only range of columns

Yes A

Then press ENTER to begin the search. The cursor will instantly find the name Hill, Max, allowing you to read off his address.

Incidentally, if the name you chose to search for found someone else with the same name first, you could use the **Next Match** command on the **BLOCKS Menu** to move on and find the next item that contained the same name.

Help with searching

It is a peculiarity of the way we remember information that we can often only remember part of what we are trying to recall. For example, we may know that the person we are trying to find lives in a town called something like Caxton – or perhaps it was Croxton? Or then again, perhaps it was Foxton. The PipeDream Search command has two facilities which help in just this type of situation.

You can type the symbols *# in the string you are looking for, to represent any combination of letters (including none). Thus, you simply have to specify

String to search for

^#xton

to find any of the towns, Caxton, Croxton or Foxton, or any other town ending in 'xton'.

You can also specify the symbols ^? which will match any single letter or character in the string you are searching for. So, if you could only remember that the name of a road had three letters, you could search for

^?^?^? Road

and you would be sure to find it.

Printing information

To print out the information in your name and address list as an orderly table, select the **Print** option from the **PRINT** menu. Press the **MENU** key until the **PRINT** menu is displayed. Select **Print** using the cursor keys, and then press **ENTER** to give the command.

Since the total width of the table of names and addresses is 144 characters (six columns of 24 characters) it will probably be too wide to fit across the width of the paper on your printer; most printers will only

print 80 characters. You will therefore need to print the table in two sections, by selecting a range of columns in each case.

The first time you give the Print command, alter the option

Print only range of Columns

No

to Yes by typing Y, followed by A C so that the option reads

Print only range of columns

Yes A C

Then press the ENTER key to start printing. Once this is finished, give the **Print** command again, this time specifying the option as

Print only range of columns

Yes DF

Alternatively, some printers will print up to 132 characters across; in this case you may be able to fit the whole table onto a single sheet of paper by first reducing the width of some of the columns using the Width command on the LAYOUT menu.

Printing selected rows

If you were going to use the name and address list for a business mail shot, you might want to compile a selective list containing only the names and addresses of people living in one particular area. The PipeDream Print command caters for this by allowing you to specify a test to be performed on each row of the document. Only those rows for which the test succeeds will be printed.

You specify the test in terms of slots in row 1; PipeDream automatically alters the slot coordinates to refer to the appropriate row as testing proceeds through the document.

For example, to print out the names and addresses of all the people living in Hants or Surrey, give the **Print** command in the usual way by displaying the **PRINT** menu and then pressing ENTER to give the **Print** command. Then move the cursor to the option

Select rows to print

No

Change the option value to Yes, by typing Y, and type in the selection expression

D1="Hants" | D1="Surrey"

The 'i' symbol means 'OR', so the whole expression means: "If the item in slot D1 is Hants or the item in slot D1 is Surrey...". In row 2 the test will apply to D2, and so on.

The selection expression can be virtually as complicated as you need, and can include tests on several different columns. For example, for a mail shot of information on a new wonder hair tonic you might want to select all men over 30 on the name and address list. The expression might be

D1="London" & G1="M" & F1>=30

where G1 was an extra column containing M or F to indicate the sex. The '&' symbol means 'AND' and can be used to link several tests together.

Calculating home expenses

The next worked example shows how to use the Z88 to perform numerical calculations. It shows how you would analyse your monthly expenses, and discover what proportion of your income you were spending on each.

You will learn how to:

- Enter numbers and expressions into a table
- Copy expressions to save typing
- Perform calculations
- Alter the format of the numbers

Designing the table

You are going to create a table which shows for each of the months January to May what your expenditure has been on your mortgage, food, car, gas and electricity, and telephone.

At first sight it might appear that an awful lot of typing would be involved in setting up such a table. However, as you will see, all the repetition is carried out automatically for you by PipeDream and very little typing is actually needed.

Moving around the document To set up the table of expenses you will need to be familiar with the procedure for moving the cursor between slots (or columns) in the document. Remember that you will need to use the following keys:

> to move up a line to move down a line SHIFT TAB to move to the previous slot to the left to move to the next slot to the right TAB ♦ TAB to move to the leftmost slot.

Also, when you are at the left-hand edge of a slot, pressing $\ \Box$ will move to the previous slot to the left, if there is one.

When you are working with a document you can use the First Column, Last Column, Top of Column, or Bottom of Column commands on the CURSOR menu to move to the four edges of the document in ■ single operation.

Labelling the table

You are now going to set up the column and row labels for the table of expenses.

Move the cursor to slot B1 and type the label Jan (for January). Likewise type Feb, March, and April in slots C1 to E1 to complete the column headings for the table. Later you could extend the table for a whole year's figures.

Now type the row labels for the different expense categories, as follows:

 In slot:
 Enter:

 A2
 Rates

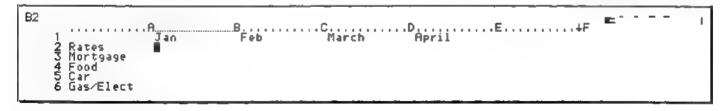
 A3
 Mortgage

 A4
 Food

 A5
 Car

 A6
 Gas/Elect

The table headings are now complete. Move the cursor back up to slot B2, and the table should appear as shown on the following screen:



Entering the rates

The rates in the example are going to be £500 per half-year. This is going to be divided evenly over each month's expenses, but you do not need to divide 500 by 6; PipeDream will do it for you. You only have to enter the expression 500/6 into slot B2 (the '/' sign means divide).

However, you first need to specify that this slot is to be an expression slot, so that whatever you type into it will be evaluated, and so that other slots on the table can refer to the result. To do this you give the **Edit Expression** command from the **EDIT** menu; alternatively you may find it more convenient to type $\Diamond X$ which has the same effect.

The slot B2 will be highlighted on the screen to show that you are editing an expression slot, and the cursor will move to the centre of the top line of the screen so that you can enter an expression. Type the expression

500/6

and press the ENTER key to enter it into slot B2. The number 83.33 will be displayed right-aligned in slot B2.

Referring to slots

You do not need to type the rates expression into the other slots in row 2; you can simply indicate that you want the same value as slot B2 by typing the coordinates of that slot.

Move to slot C2 and press $\diamond X$ to enter an expression. Then type

B2

and press ENTER. The value 83.33 will appear in slot C2. Likewise enter the expression 82 into slots D2 and E2.

Effectively you have specified that you always want slots C2 to E2 to contain the same value as slot B2. So, for example, suppose you were granted a rates reduction to £400 per half-year. Move the cursor back to slot B2 and type $\Diamond X$ to display the slot's previous contents, 500/6. Delete them, by typing

and then type the new value:

400/6 ENTER

Not only will the value in B2 change to 66.67, but slots C2 to E2 will also change, since they refer to this value.

Replicating values

Next you are going to enter the figure 200 for the four months' mortgage payments. Type 200 into slot B3. If you forgot to type $\Diamond X$ when entering the figure, the number will appear left-aligned just as you entered it. In this case, move the cursor back to the slot and press $\Diamond X$ and then ENTER afterwards.

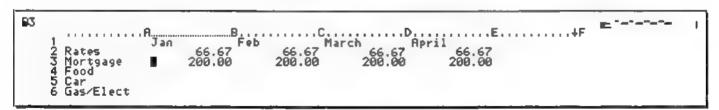
You do not need to type the same value in slots C3 to E3; the Replicate command will do it automatically.

Select the **Replicate** command from the **BLOCKS** menu, and press \blacksquare NTER to execute it. Answer the prompts as follows, pressing \bigcirc to move to the next line after entering B3:

Range to copy from Range to copy to

B3 C3 F3

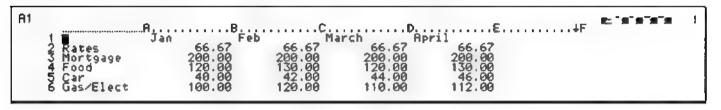
This says that you are going to replicate the value in slot B3 to the range of slots C3 to E3. Press [NTER] to give the command, and the figure 200.00 should appear across the entire row so that the table appears as shown:



Note that until you press the ENTER key you can alter the values you have typed for the ranges, moving between the two prompts with Ω and Ω .

Other expenses

The expenses in the other categories will tend to vary each month. You can either type in the figures used in the example shown below, or use figures from your own experience. In either case complete the table, remembering to make each slot into an expression slot before you enter the figure, or if you forget, afterwards.



Monthly totals

You are now going to produce monthly totals for the expenses. Enter the label TOTAL into slot A7, and press TAB to move the cursor to slot B7.

Now press ♦X, and enter the following expression:

sum(B2 B6)

Press the ENTER key, and PipeDream will perform the calculation and instantly display the sum of the figures in the range of slots B2 to B6; ie all the expenses for January.

The function sum(B2 B6) is a convenient way of writing the equivalent expression

B2+B3+B4+B5+B6

where the slots to be added are all in a row, column, or rectangular table.

Replicating slot references

Just as you replicated the value 200.00 above, you can also replicate an expression across a range of slots. Where the expression contains references to other slots, as in this example sum(82 86), the references will automatically be altered to reflect the change in position.

Replicate the expression you have just entered for slot B7 to slots C7 to E7 as follows. Select the Replicate command from the BLOCKS menu, and give the options as:

Range to copy from Range to copy to

B7 C7 E7

Press ENTER and totals will appear for each column. The Replicate command has automatically altered the range B2B6 to give the appropriate totals in columns C to E.

If you now move the cursor to slot C7 you will see the expression in that slot displayed at the top left-hand side of the screen:

sum(C2C6)

Note that PipeDream removes unnecessary spaces when storing an expression.

В7	sum(B2B6) 2 Rates 3 Mortgage 4 Food 5 Car 6 Gas/Elect 7 TOTAL	AB 66.67 200.00 120.00 40.00 100.00 526.67		66.67 200.00 120.00 44.00 110.00 540.67	66.67 200.00 130.00 46.00 112.00 554.67	∳F ⊯ "afafafa	· I
----	---	--	--	--	--	---------------	-----

Percentage expenditures

As a final illustration of the power of PipeDream in analysing figures, you are going to calculate the percentage expenditure represented by each of the categories in the table.

First type the label

Percentage

in slot F1.

Next find the total expenditure for the four months in the table. Move to slot F7, press $\Diamond X$, and enter the expression

sum(B7 E7)

Instead of typing the references B7 and E7, you can 'point to' each slot by moving the highlighted slot with the keys $\overline{\text{TAB}}$, $\overline{\text{SHFT}}$ $\overline{\text{TAB}}$, $\overline{\hookrightarrow}$, and $\overline{\hookrightarrow}$, and then give the **Insert Reference** command, $\diamond K$, to enter the corresponding references, B7 and then E7, into the editing line.

Now move to F2 and enter the following expression (which will be explained in a moment):

sum(B2 E2)/\$F\$7 * 100

Press ENTER to enter the expression.

This expression is built up as follows:

sum(82 E2) is the total spent on rates for the four months.

F7 is the overall total expenditure for the four months. The \$ signs 'freeze' the reference so that when the expression is replicated, the reference to F7 will remain the same.

sum(82 E2)/\$F\$7 is thus the proportion of the overall expenditure spent on rates.

sum(B2 E2)/\$F\$7 * 100 expresses this proportion as a percentage.

Now replicate this expression down the remaining slots in column F by giving the Replicate command from the BLOCKS menu, and entering the options as

Range to copy from F2
Range to copy to F3 F6

The appropriate percentages will be displayed against each category.

6 Gas/Elect 100.00 120.00 110.00 112.00 20.27

Changing the format

When you first start using PipeDream, the results of all expression slots are displayed with two decimal places, the most useful format for working with financial calculations (although values are stored internally with full accuracy).

You can alter the display format for all expression slots in your document by changing the *Decimal Places* option on the **Options Page** menu, or for individual slots with the **Decimal Places** command on the **LAYOUT** menu.

For example, the table would look tidier if the percentages were displayed with no decimal places. First, mark the block of slots containing the percentages with the following procedure:

- Move the cursor to F6 and give the Mark Block command again.

The block containing slots F2 to F6 will now be highlighted.

Now select the **Decimal Places** command from the **LAYOUT** menu. Reply to the prompts as follows:

Number of decimal places 0
Floating format No

Press ENTER and the numbers will be displayed with no decimal places.

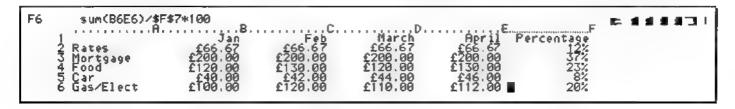
You can also specify that certain characters, given on the **Options Page**, should be displayed before or after certain numbers in the document. By default, the trailing characters are set to '%', and the leading characters are set to '£'.

To display a '%' sign after the numbers in the marked block, give the **Trailing Characters** command from the **LAYOUT** menu.

You can also display a '£' sign before each value in the table. Mark the block of slots from B2 to E7 by moving the cursor to each of these slots in turn and typing �Z. Then give the **Leading Characters** command from the **LAYOUT** menu.

Finally, the column labels can be right-aligned. Mark slots B1 to F1 with the Mark Block command, $\Diamond Z$, and give the Right Align command from the LAYOUT menu.

Press $\diamond O$ to clear the marked area, and the table will now appear as shown:



What you have learnt

These three examples have demonstrated how PipeDream can help you to write letters and design text documents (word processing), set up lists of information, sort them, retrieve the items you need (databases), and set up and perform calculations on tables of numerical or financial information (spreadsheets).

For simplicity, each example focussed on one aspect of PipeDream's capabilities. However, the real power of PipeDream comes in its ability to mix all three different functions in a single document. For example, the expense account could be incorporated into a letter to your bank manager, the name and address list could include financial information and calculations, or the party invitation could be automatically addressed to everyone on your name and address list.

You are now in a position to start using PipeDream for your own applications, but to get the most out of its facilities you will probably want to read through the list of commands given in Section Five. You will then be able to refer back to it when your requirements of PipeDream become more advanced.

Section Three Using the Diary

This chapter will show how you can use the Z88 Diary application to organise your engagements, and plan your time. It demonstrates how to:

- Enter engagements into the Diary
- Search for and list out all engagements relating a particular thing
- Use the Diary with the Calendar popdown to find any date very quickly

Entering the Diary

Before using the Diary, make sure you have set the correct time and date on the Clock popdown, as described in Section One.

You can enter the Diary in either of two equivalent ways, whichever you find most convenient:

Either: go into the Index, by pressing the NDEX key, and select the Diary from the APPLICATIONS list by pressing the Ω and Ω keys until the Diary item is highlighted. Then press the ENTER key to enter it.

Or: type \Box D. You can do this from anywhere, even another application.

Once you have made entries in the Diary, it will appear on the list of SUSPENDED ACTIVITIES in the Index, but there can only be one copy of the Diary.

Type ♦CT to go to today's date, and the Diary screen display similar to the diagram shown below will appear:







This gives you a page for today's date, onto which you can type information in any form you like. The information is stored permanently in the diary, and you will be able to refer back to it on another occasion.

Making a Diary entry

Try typing the following appointments onto today's page in the Diary, pressing the TAB and ENTER keys where indicated to lay out the lines neatly:

Work: TAB 10.00 Sales meeting ENTER Simon: TAB 12.30 Pick up from station ENTER

You can actually lay out information in the Diary however you like, but it is a good idea to label your appointments, as in the example above, because you will then be able to locate everything in a particular category by searching for the appropriate label. An example of this is given below.

Moving between days

You can move between days in the Diary by typing

□ to go to the next day
to go to the previous day

Try moving to the day after tomorrow, by typing $\Box \emptyset$ twice.

Then enter the following appointment:

Work: [TAB] 11.00 Present report to Board ENTER

Searching for Diary entries

The Diary provides a powerful **Search** command which enables you to find and list out all appointments in a particular category.

As an illustration, the following example provides a list of all appointments relating to Work.

First select the **BLOCKS** menu, by pressing the MENU key until **BLOCKS** is highlighted on the menu bar at the left-hand side of the screen. Then move the cursor to highlight **Search** on the menu, and press ENTER to give the command.

The following prompts will be displayed:

----- STRING TO SEARCH FOR -----

Below the prompt STRING TO SEARCH FOR type

Work:

Then press 0 three times to move the cursor to the line

and type Y to alter the value of the option to Yes.

Now press ENTER, since the other options are not relevant, and the appointments will be listed:

Thursday 17th March 1987 Work: 10,00 Sales meeting

Saturday 19th March 1987

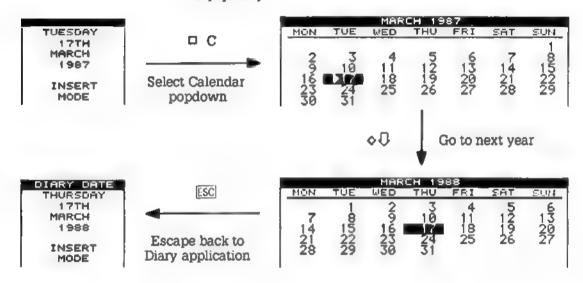
Work: 11.00 Present report to board

Of course, in your case the dates will be different, corresponding to the information you have used.

Using the Calendar and Diary together

By calling the Calendar popdown from within the Diary, you can move quickly between different dates, and the Diary will then give the page for the date you have selected.

For example, having forgotten a friend's birthday on the 17th March, you decide to make an entry in the Diary to make sure you do not forget it the following year. Use the following procedure to find the right day very quickly:



You are now on the diary page for the same date one year later, and can type in the reminder.

Refer to the following section for a full list of the Calendar operations.

Section Four

Using the popdowns

The Z88 popdowns are utility programs that you can make use of while you are working within another application, such as PipeDream, the Diary, or BBC BASIC. They pop down over your application screen, and disappear again when you press SSC to return to the application.

The following popdowns are provided in the Z88:

Calculator - □R Perform calculations

Calendar - □C Look up dates

Clock - □T See the current time, and today's date

Alarm - □A Set alarms and reminders

Filer - □F Perform operations with files

Panel - □S Customise the Z88 to your requirements

Import/Export - □X Transfer documents between the Z88 and other makes of computer

Index - NDEX or DI Enter applications, popdowns, or suspended activities, and examine which cards are present

Using popdowns

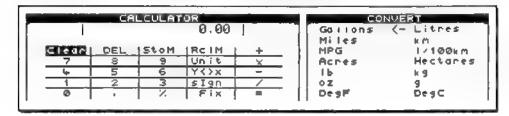
You can either call a popdown by pressing the □ key combination given above, or from the Index as follows:

Calling a popdown from the Index

Highlight the popdown's name on the APPLICATIONS list. You can move the bar highlighting items on this menu by pressing the Ω and Ω keys at the bottom right of the keyboard. If you move the bar too far, press Ω to go up again. Then press ENTER to run the popdown you have selected.

The Calculator $-\Box R$

If you ever need to perform calculations while using the Z88 you can simply call up the Calculator popdown, even if you are in the middle of doing something else at the time:



The top line of the calculator displays the result of your calculation – initially 0.00 – and below that are the calculator keys. You can press these in either of two ways, depending on your preference.

Either: Use the cursor keys $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$ to highlight the operation you want, and then press ENTER to enter the selected key.

Or: Type the Z88 key corresponding to the key you want, as listed on the next page.

Calculator Key Legend:	Z88 Key Equivalent:	Function:
Clear	C	Clear
DEL	DEL	Delete last keypress
StoM	S	Store to memory 0 to 9
RclM	R	Recall from memory 0 to
0 to 9	0 to 9	Enter digit
	1.	Decimal point
Unit	U	Convert units (see below)
Y<>x	Y	Swap y and x
sign	I	Change sign
Fix	F	Number of decimal places
%	1%	Percentage (see below)
+	+ or P	Plus
x	X, *, or T	Times
-	- or M	Minus
/	/, or D	Divide
=	=	Result

Entering numbers

Enter a number by selecting the digits with the cursor keys, and press ENTER; or just type the number with the keys 0-9. You can use C or DEL to correct typing mistakes. Numbers can contain a decimal point, obtained by typing the full-stop key, and can be entered in scientific notation, as in

1.27E6, entered as 1 . 2 7 E 6, which means 1.27×10^6 .

7.1E-13, entered as 7 . 1 E I 1 3, which means 7.1×10^{-13} .

The two operands of an operation can be exchanged, before pressing =, by selecting the Y<>x operation, or pressing Y. For example, to find the reciprocal of a previous calculation, enter

/ 1 Y =

All calculations are performed to an accuracy of nine decimal places, and numbers can lie between 1E38 and 1E-38. The Calculator displays Error if an error, such as 1/0, occurs.

Display format

The format in which numbers are displayed can be altered with the Fix operation, which gives the prompt

Fix?

Typing ■ number between 0 and 8 will fix the number of decimal places displayed to the specified number; the initial value is 2. Typing ■ will give free format.

Constants

Entering a number, followed by one of the arithmetic keys pressed twice, stores the operation as a constant operation and displays the operator with K at the top right-hand corner of the screen.

For example, entering

1.15 * *

sets up constant multiplication by 1.15, and displays * K; entering

1000 =

then gives the result 1150.00, and

2000 =

gives the result 2300.00.

Storing and Recalling

You can store a result for use later in a calculation with the StoM and RclM operations.

To store ≡ result, select the StoM operation (or type S). The prompt

StoM ?

will be given, to which you should give a register number by typing a digit from 0 to 9. Up to ten different results can be stored, one in each register.

You can also add a result into a register, subtract a result from a register, multiply a register by a result, or divide a register by a result,

by giving the StoM operation followed by '+', '–', '*', or '/' respectively, followed by the register 0 to 9.

You can cancel a store operation in the middle by pressing $\overline{{\tt ESC}}.$

For example,

1.2 S 9

stores 1.2 in register 9, and

3.56 5-9

subtracts 3.56 from the same register. Finally

R 9

recalls the result from register 9.

Percentages

The '%' key works in conjunction with one of the other keys '*', '/', '+', or '-' to calculate percentages, and to add or subtract a given percentage to or from a number. The following examples illustrate each of these cases.

To find 12% of 1500 enter

1500 * 12 %

To express 660/880 as a percentage, enter

660 / 880 %

To add 15% on to 125 enter

125 * 15 % +

Likewise, to discount 125 by 15% enter

125 * 15 % -

Converting units

You can convert any result between the pairs of units displayed on the **CONVERT** menu by selecting the *Unit* operation.

Highlight the unit you want to convert to using the cursor keys, and press ENTER to perform the conversion. For example, to convert from Litres to Gallons highlight Gallons, and to convert from Gallons to Litres highlight Litres. To exit from the CONVERT menu press ESC.

The Calendar - □C

The Calendar provides a convenient tool for planning your engagements, particularly when you want to look up dates quickly without leaving the application you are currently working on. Calling the Calendar displays the page for the current month, or the month you last looked at:

MARCH 1987						
MON	TUE	WED	THU	FRI	SAT	SUN
29 16 23 30	3 10 24 31	11 18 25	5 12 19 26	13 28 27	7 14 21 28	1 15 22 29

You use the cursor keys, in combination with the SHFT and ♦ keys, to move about within the calendar as follows:

\Box	previous day	\Rightarrow	next day
Û .	previous week	Ω _	next week
SHIFT 1	previous month	SHIFT 🗸	next month
♦ ①	previous year	♦ Û	next year

If necessary, the calendar will automatically turn a page to the next or previous month.

The Calendar is accurate back to the year 1753 (when the Gregorian calendar was accepted in England) and so has historical applications in addition to its obvious business uses.

Searching for a day

You can also use the Calendar to go immediately to any date in any year.

Press ENTER, and the prompt

Look for: 17/03/1987

will be displayed, with today's date initially displayed. Type in the date you are searching for, and press the ENTER key. The cursor will move to the specified day.

The date can also be entered in the form

17 mar 1987

if you find this more convenient. The Z88 defaults to the twentieth century, so 17 mar 87 is equivalent to 17 mar 1987.

Active days

If the Calendar popdown is called from the Diary application, days containing information in the Diary will be identified on the Calendar with a pointer against the date

▶17

Such active days can be found in the Calendar very quickly with the commands

□ < previous active day □ ⇔ next active day

The Clock - □T

The Clock popdown can be called whenever you need to see the correct time or date. The time is displayed in 24-hour format, and is accurate to within a few seconds per day. To set the time and date, see the details given in **Set the clock**, p. 9.



Press ESC to return to the current application.

Because you may be using the Clock popdown to time something, the Z88 will not switch off after the timeout period if the clock is displayed on the screen.

The Alarm - □A

The Alarm popdown can be used to make your Z88 remind you of important events or appointments, or simply to wake you up in the morning. Any number of alarms can be set up, and for each alarm you can specify the following information:

DATE

The date on which the first alarm will occur. For a new alarm this is initially set to the current date, or if the alarm is called from the Calendar or Diary, the Calendar or Diary date.

TIME

The time at which the alarm will occur. For a new alarm this is set to the current time, but you will usually alter it to the required alarm time. All times in the Alarm are given in 24-hour format.

REASON/COMMAND

For each alarm you can specify a message of up to 23 characters, or a CLI command string which will be executed to cause something to happen; see below.

To set an alarm, press ENTER. The alarms you have set up will become active as soon as you exit from the popdown by pressing ESC.

Note that the Z88 will not switch off automatically while the alarm popdown is on the screen.

Alarm options

Each alarm can also have the following optional settings:

Bell: can be on or off, determining whether the Z88 bleeper sounds when the alarm is activated.

Alarm type: normally ALARM. This can be altered to EXECUTE to allow a command, in the REASON FOR ALARM field, to be executed when the

alarm is activated. Thus you could, for example, cause the Diary to be entered and a line of text to be typed in automatically on an alarm:

#DICT Urgent message

For more information on executing commands, see CLI files, p. 179.

Repeat every: normally set to NEVER, so that an alarm will occur just once, at the specified time and date. The repeat rate can be altered to one of the following to obtain a repeating alarm:

YEAR, MONTH, WEEK, DAY, HOUR, MINUTE, SECOND

No. of times: specifies the number of times that the alarm will be repeated before being cancelled. It is initially set to NEVER, so that the alarm will occur just once. It can be set to FOREVER by pressing \bigcirc , or a number from one upwards by pressing \bigcirc . Holding the SHFT key down while pressing \bigcirc or \bigcirc will increase or decrease the number in tens, and \bigcirc and \bigcirc will change it in hundreds.

By setting these fields appropriately, you can obtain almost every possible alarm setting. For example, to cause an alarm to occur on the 3rd March, 3rd April, and 3rd May, at 12.00, set

DATE 3 Mar 1987 REPEAT EVERY 1 MONTH 12.00 NO. OF TIMES 3

Note: Do not set the alarm to repeat every second for ever. You will not be able to cancel it without doing a soft reset.

Clearing alarms

To clear an alarm, select it with the cursor keys ① or ♥ on the list of alarms, select clear alarm with ♥ and ♥, and press ENTER. With a repeating alarm this just clears the present alarm; use clear alarm twice to remove a repeating alarm completely.

If an alarm occurs while the Z88 is turned off, the alarm will sound and the Z88 will be turned on in LOCK OUT state to prevent accidental keypresses. To clear this state turn the Z88 off and then on again in the usual way, by pressing both SHFT keys.

The Filer – \Box F

With extension RAM and EPROM cards fitted, you will have the ability to store many documents in your Z88. The Filer provides everything you will need for organising these; in particular it allows you to:

- Obtain a list (catalogue) of all your files, or the files in the optional EPROM card (Catalogue Files and Catalogue EPROM).
- Move files to and from an EPROM, which provides permanent storage on a removable card in slot 3 of the Z88 (Save to EPROM and Fetch from EPROM).
- Change the names of files within the filing system (Rename).
- Make additional copies of files (Copy), or remove files completely (Erase).

Other commands, for more advanced use of the Filer, are explained in the Filer Reference section.

When you have finished using the Filer, press ESC to return to the original application.

Hierarchical structure

The Z88 filing system is a hierarchical filing system. This means that you can group files together within 'directories'. This facility is akin to keeping similar documents in a folder within a filing cabinet, and is of great assistance in keeping a large number of files orderly. However, for simple use of the filing system you will not need to use these facilities; see the Filer Reference section for a full description.

Note: With Operating Systems up to and including 3.0 it is important that you only exit the Filer by pressing ESC. In particular, if you are using Catalogue Files (♦CF) or Catalogue EPROM (♦CE) and you exit the Filer in the middle of the operation by using NOEX or □ followed by a letter, then one of the files can become marked as 'IN USE', and you will not be able to access it without performing a soft reset.

Entering the Filer The Filer display consists of two windows: a COMMANDS window, and a DIRECTORY window: Commands Catalogue window Directory Allows a Filer command to Lists all the files and directories Shows the currently-selected device and directory. be selected and executed. in the current directory. DIRECTORY: OΖ FILER COMMENDS WORK SPREADSHEETS LETTERS.PD CATALOGUE FILES Novel, txt SAVE TO EPROM FETCH FROM EPROM COFY RENAME FRASE Selected file Filename Commands menu Directory Lists the Filer Marker indicates files that Directory names are in Filenames can be upper have been selected. small capitals. and lower case commands.

File names

Each file or directory in the filing system has a name of up to twelve letters or digits. This can be followed by a full stop and up to three further letters or digits called the *extension*, and is normally used to describe the type of the file. Thus a BASIC program could be saved as

game.bas

where bas is an extension used for all BASIC programs.

Upper- and lower-case letters are treated as equivalent in file names. In the catalogue window directories are displayed in a small typeface.

Specifying devices

When saving and loading files to and from applications, such as PipeDream, you will normally just give the file name and extension, if there is one. However, the Filer keeps a fuller description of where the file is in the system, including which RAM card it is on (the *device*), and several of the Filer commands will show this full form of the file name.

The full form of a file name is

:DEVICE/filename

The most useful options for DEVICE are:

: RAM . 0 RAM in slot 0 (internal memory)

: RAM. 1 to : RAM. 3 RAM in slots 1 to 3 (external memory)

A full list is given in the Filer Reference section.

* can be used in any part of a file name to match any characters; thus

game*

represents any file name beginning with game, and

:RAM.*

represents all the RAM in the Z88.

Giving Filer commands

You can give filer commands in one of three ways, depending which you find most convenient:

- ⑤ Select the command from the Filer COMMANDS list, using the 分 and ∜ keys. The list of commands will scroll up if you move the cursor below the bottom of the screen. Then press ENTER to give the command.
- Select the command from the COMMANDS menu with the cursor keys, and press ENTER to give the command.
- ③ Give the ♦ key sequence for the command, as listed below.

COMMANDS menu

Press MENU to see the COMMANDS menu:

Catalogue Files COMMRHDS Copy Rename Erase Execute Select First Files Select Extra Files	+CF +CO +RE +ER +ER + 5MT MII	Create Directory Select Directory Up Directory Down Directory Cursor Right Cursor Left Cursor Up Cursor Down	♦CD ♦SI SMIFT © SMIFT © © ©	Catalogue EPROM Save to EPROM Fetch from EPROM Select Device Tree Copy Name Match	OCE OESF OSC OTC ONM	ADVANCE P P P SELECT SITE ACTION ESC RESUME	OZ
--	--	--	--	--	----------------------------------	---	----

Selecting files

The Filer provides two ways of identifying the files you wish to operate on.

Either: Type the file name after the Filer prompt

Name: 🛢

Or: Select the file or files in the catalogue window, as described below.

Select First File - ENTER or TAB
Select Extra File - SHFT ENTER or TAB

Select the first file by highlighting the file name using the cursor keys, and press ENTER (or TAB). You can select further files, if required for an operation that can be performed on several files at once (eg Erase), using SHFT ENTER (or TAB) again).

When selected, files are indicated by a marker to the left of the file name in the catalogue window, as shown in the example on p. 81.

Filer commands

The commands for simple use of the Filer are listed below; for full use of the hierarchical directory structure, see Section Seven – Filer Reference, p. 175

Catalogue Files - ♦CF

Gives fuller information about \blacksquare specified list of files. The subset of files to be catalogued is specified after the prompt

Name :

Reply as follows:

ENTER	catalogues all files (in the current directory)
fred*	catalogues all files beginning with fred
*.bas	catalogues all files with a bas extension

Each file will be listed as:

File name	Creation time a	nd date	Last updated	time and date	Size in characters
letter.txt	Today	17:42:54	Today	17:42:54	1254
novel.txt	01-Jun-1987	17:41:17	Today	14:32:50	13112
game.bas	02-Jun-1987	12:27:43	02-Jun-1987	12:27:43	827

(The last updated time and date are only relevant if **OPENUP** is used from BASIC.) If the file is open at the time it is catalogued, the size will not be shown.

When you catalogue or save to a blank EPROM, the display will go blank for a few seconds while the EPROM is checked.

Catalogue EPROM - ♦CE

Gives a list of information on all files in an EPROM card fitted in slot 3. The directories and file names will be given to show where the files originally came from.

Save to EPROM - ♦ES

Copies files from the filing system to an EPROM card fitted in slot 3. The file or files to be saved can either be selected as already described, or specified after the prompt

Name : ■

Note that while a file is being saved to EPROM the screen will blank intermittently until saving is completed, when the Z88 will bleep.

Fetch from EPROM - ♦EF

Copies files from EPROM card in slot 3 back to the filing system. Gives the prompts

Source : Destination :

Source: specifies the name of the file in the EPROM.

Destination: gives the name it is to be saved as in the destination filing system. It is initially set to the same as the source name, but you can edit it if you want to save the file under a different name.

Copy - ♦CO

Makes a second copy of a file. Gives the prompt

Name :

allowing you to specify the file name to be copied, followed by the prompt

New name :

for the name of the copy.

Multiple files (selected in the catalogue window) can be merged into a single file with the **Copy** command; they will be appended in the order in which they were selected.

Rename - <RE

Allows the name of a file to be altered. Gives the prompts

Name : New name : For example, to change the name of a file from game.bas to oldversion you would specify

Name : game.bas New name : oldversion

Note that you cannot use the **Rename** command to move a file from one directory or device to another. The new name must be a simple file name; devices and path names are not permitted.

Erase - **¢**ER

Allows one or more files to be removed from the filing system. Gives the prompt

Name :

followed by the prompt

Confirm each file ? Yes

Pressing ENTER will prompt for each file you have selected to be erased, so allowing you to change your decision for any particular file.

Alternatively, changing the option to No by typing N will erase all the selected files without further prompting.

You will not be permitted to erase a file which is in use; for example, a directory containing other files, or an open BASIC file.

Files can only be erased from the EPROM with the ultra-violet EPROM eraser.

Note that because parts of an erased file may still be present, you should not rely on the **Erase** command for disposing of confidential information from the system.

Advanced Filer commands

The remaining Filer commands are for advanced use of the Filer, and the hierarchical directory structure; these are explained in the **Section Seven – Filer Reference**, p. 175.

The Panel - □S

The Panel popdown allows you to set up aspects of the Z88's operation to suit your own preferences. You can alter the rate at which keys on the keyboard auto-repeat when you hold them down, the time after which the Z88 will automatically switch off, the default device and directory used by the Filer, and the parameters for the serial interface.

You can call up the panel by typing □S (for Settings).

Altering the panel

appropriate line with the cursor keys $\bigcirc, \bigcirc, \bigcirc$, and \bigcirc . Then type in the new value for the option, and press [ENTER].

To alter an option on the panel, first select it by moving the cursor to the

In the case of options with alternative values you can also select between the alternatives by giving the **Next Option** command, $\diamondsuit J$, or you can specify the option you want by typing the option's first letter.

You can save a particular set of panel settings in a panel file, using the **Save** command on the **FILES** menu. Selecting the **New** command on the **FILES** menu returns the settings to their initial values.

Panel options

For each of the following options the initial default value is shown in brackets.

Note that options marked † affect only the state of new activities, and existing activities retain their original settings.

Keyboard options

Auto-repeat rate (6): determines the rate at which keys auto-repeat when held down continuously. Smaller values increase the repeat rate. A value of 0 gives no auto-repeat.

Keyclick (No): altering the option to Yes gives an audible bleep at each keypress, to provide additional feedback during touch-typing.

t Insert/Overtype (Insert): in Insert mode text typed at the keyboard is inserted at the cursor position, and subsequent text on the line moves to the right to make space for the new text. Some typists prefer Overtype mode, in which text types over any text previously on the line. To insert text in Overtype mode you need to make a gap in the line with the Insert Character command OU first.

Filer options

- † Default device (:RAM.0): the device to and from which files are saved and loaded, which is set to the internal RAM memory filing system by default. It can also be set to :RAM.1, :RAM.2, or :RAM.3, corresponding to the three RAM cards.
- † Default directory: allows a path of one or more directories, which should already exist, to be specified for all filing-system operations. By default the top-level directory is selected.

Machine options

Timeout (mins) (5): determines the time after which the Z88 will switch off if nothing is typed at the keyboard; a value of 0 disables timeout. Setting the timeout to 2 minutes will extend the effective battery life of the Z88 (1 minute is possible but not recommended for normal use).

Sound (Yes): allows the internal sound system to be switched off.

Map (Yes): allows the PipeDream page map display to be turned off if not required. Typing and editing will be marginally faster when the map is disabled.

Map size (80): allows the size of the map to be altered up to a maximum size of 92 characters across, or 255 characters across on a Z88 with at least 128K in card slot 1. Reducing the size of the map allows a larger text display width to be used in PipeDream.

Date format (European): determines the format for all dates in the Z88; the default date format is European, so that dates are recognised in the form:

day/month/year

The option can be changed to American to work with the format

month/day/year

Serial port parameters

1 Transmit baud rate (9600) / Receive baud rate (9600): can both be set to any of the following values:

75, 300, 600, 1200, 2400, 9600, 19200, 38400

- 7. Parity (None): can be set to None, Space, Mark, Odd, or Even. The number of data bits is 8 if None is specified, or 7 otherwise.
- 3 . Xon/Xoff (Yes): determines whether the serial communication protocol uses Xon/Xoff.
- 1. The number of start and stop bits is fixed as follows:

/ Transmit: 1 start bit, 2 stop bits.
Receive: 1 start bit, 1 stop bit.

Note: In versions of the Operating System up to and including 3.0 ODD and EVEN parity settings do not result in correct behaviour.

Import/Export – □X

The Import/Export popdown enables you to transfer files between the Z88 and other makes of computer. It communicates with the other computer through the serial port on the right-hand side of the machine. To use Import/Export you will need an Import/Export program for the other computer, and a connecting lead. Follow the directions supplied with this for \blacksquare detailed explanation.

Details of the serial port connections are given in Appendix B.

Using Import/Export

The serial parameters should be set up in the Panel before running Import/Export. Also run the program on the machine you wish to communicate with.

The program recognises the following commands, which are given by typing the first letter of the command:

S)end file

Prompts for the name of the file to be transmitted, and then transmits the name and file to the receiving computer. Wildcards are accepted in the file name.

R)eceive file

Prompts for a file name; press ENTER to receive a file and use its transmitted name, or type a name to rename the received file.

B)atch receive

Receives a sequence of named files, terminated by an end batch code.

E)nd batch

Sends an end batch code (ESC Z).

To send a batch of files use the following procedure:

- ① Give the Batch receive command on the receiving computer
- ② Send each file with a **Send file** command (or give a '*' wildcard in the file name)
- ③ Give an End batch command.

Import/Export protocol

The Import/Export protocol is given here for programmers who want to interface the Z88 to a computer by writing their own interface software.

Control sequences

Sequence	Function
ESC N	Start of file name
ESC F	Start of file/end of file name
ESC E	End of file
ESC Z	End of file or end of list of files
ESC B x x	Where x x is two ASCII digits representing ■ hex byte. For example, the byte &A9 is transmitted with ESC B A 9.
XON = &11 XOFF = &13	Receiver sends to transmitter to restart flow. Receiver sends to transmitter to stop flow.

Note that all the characters after the ESC code must be in upper-case ASCII.

Transfer protocol

First file, and subsequent files: ESC N filename ESC F data ESC E

Last file:

ESC N filename ESC F data ESC Z

where data is a sequence of characters in the range &20 to &7E. Codes in the range &00 to &1F and &7F to &FF should be transmitted using the ESC B prefix.

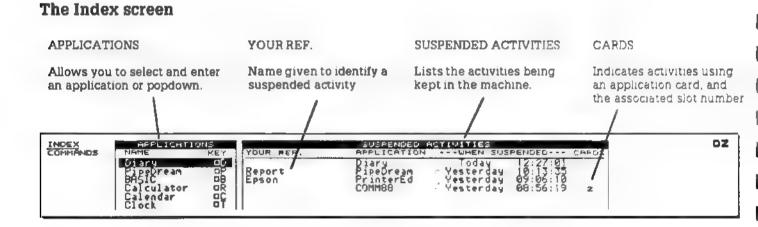
Import/Export will give a Suspended message if a battery low is flagged while sending or receiving, or if the Z88 is switched off or the flap is opened. In this case you must repeat the transfer.

The filename can be omitted.

The Index $-\Box I$

The Index popdown allows you to

- Enter popdowns or applications.
- Start PipeDream (or BBC BASIC) with a new, blank, document (or program).
- Obtain a list of all the suspended activities you have in the 288, and remove activities you no longer need.
- Insert and remove RAM, ROM, or EPROM cards.



Entering an application

To enter an application, or a popdown, select its name on the APPLICATIONS list by moving the highlighting bar up and down with the cursor keys Ω and Ω , and press the ENTER key:

Diary	□D
PipeDream	ΠP
BASIC	□B
Calculator	□R
Calendar	□C
Clock	ΠT
Alarm	ΠA
Filer	OF
PrinterEd	DΕ
Panel	
Terminal	ΠV
Imp-Export	

When the bar reaches the bottom of the screen, the list scrolls up to show the remaining options.

Entering PipeDream (or BBC BASIC) from the Index APPLICATIONS list creates a new, blank document (or program).

Suspended activities

The SUSPENDED ACTIVITIES list shows the following information for each suspended activity:

Heading	Meaning
YOUR REF	The name given to the document (with the PipeDream \diamond FC or \diamond FL commands, the Diary or PrinterEd \diamond FC, \diamond FS, or \diamond FL commands, or the BASIC *NAME command)
APPLICATION	The application name
WHEN SUSPENDED	The time and date the document was suspended
CARDS	The number of the card slot, for activities using an application card

There can be more than one PipeDream and BBC BASIC suspended activity, but only one for each of the other applications.

Re-entering a suspended activity

To re-enter a suspended activity, select it by moving the highlighting bar across with the cursor keys, and then press the ENTER key.

Alternatively, pressing P or B repeatedly will enter each PipeDream or BBC BASIC activity in turn.

Killing activities - OKILL

To kill a suspended activity, select it on the SUSPENDED ACTIVITIES list with the cursor, and type OKILL. The activity will be removed from the list, and the document (or program) associated with it will be lost. OPURGE is equivalent to a soft reset, which kills all suspended activities, and should therefore be used with great caution.

Cards

There are three types of card for use with the Z88:

RAM cards are for storing your own information.

Application cards, referred to as ROM cards, are used for plug-in programs and help text.

EPROM cards allow you to write information once only, but retain it even when removed from the machine thus providing a secure way of saving your data.

Card information - ♦CARD

The **CARD** command, on the Index COMMANDS menu, shows the type and size of the card in each slot.

Inserting or removing cards

Cards should only be inserted or removed with the Z88 switched on.

First enter the Index. Then open the perspex flap at the front of the machine. Check that the screen goes blank. The computer should bleep once as you open the flap. The card can then be pushed in or pulled out. The label on the end of the card should be upright when you push the card home. When you have completed the operation, push the perspex flap back into position.

Card errors

Errors which occur during the insertion or removal of cards are displayed in the **OZ** position at the left-hand side of the screen.

A FAIL message is given if a RAM card is removed, indicating that a soft reset is necessary.

If you remove an application card which suspended activity is using, the Z88 will give a continuous tone and flash card until the card is replaced. The suspended activity should be removed with **KILL** before trying again.

An INDEX message is given, together with a continuous tone, if you have attempted to remove an application card while not in the Index.

RAM cards

RAM cards allow you to store more data in the Z88. RAM cards are available in different sizes; the 32K RAM approximately doubles the storage of the Z88, providing space for an extra 32,000 characters. The 128K RAM increases memory even more, allowing you to use the Z88 to store very large documents, diaries, or programs.

It is recommended that you avoid using slot 3 for RAM cards because they draw more current in slot 3 than in slots 1 and 2, and slot 3 would then not be available for EPROM cards.

Expansion facilities

Some additional facilities will be available on a 288 which has a RAM card of at least 128K in slot 1:

Less than 128K in slot 1	128K or more in slot 1
Map limited to 92 pixels	Map can be up to 255 pixels
BASIC workspace 8K	BASIC workspace 40K

RAM card FAIL

If you do accidentally remove a RAM card, a Fill message will appear and a soft reset will be necessary. The Z88 will attempt to keep all the files in the remaining RAM. If you need to change a RAM card you must therefore save all your important data into another RAM card, EPROM,

or transfer your files to another computer using the Import/Export programs.

Since the RAM cards draw their power from the Z88, the contents will be lost if the Z88 loses its power.

Using the Filer with extra RAM

Files are normally stored in the internal memory. To make the Z88 use the external card you need to set the DEVICE to : RAM, n where n is the slot number (shown in white letters on the flap). The device used by new applications is determined by the Panel setting.

For example, if you have a RAM card in slot 1, set the Panel:

Default Device : RAM.1

Each existing application will store the device it is using. To alter these, first go into the application, and then use the **Select Device** in the Filer to change the device setting for each application you want to use the new RAM card.

EPROM cards

EPROM cards can be inserted or removed at any time, except when you are actually reading or writing to EPROM. The EPROM card must go into the right-hand slot, labelled 3.

When you catalogue or save to a blank EPROM, the display will go blank for a few seconds while the EPROM is checked.

EPROM cards provide the best method of archiving valuable data files or programs. Once the EPROM is full, the recommended way to erase it (if required) is to use the ultra-violet EPROM ERASER from Cambridge Computer Ltd.

Note that an EPROM card should be removed before restoring power to a Z88 in any of the following circumstances, or data may be corrupted: after it has been left unpowered; after it has been left for some weeks so that the batteries have failed; after a persistent battery low sign; or when changing the batteries.

Never leave EPROM cards where sunlight can shine onto the round window. Significant exposure to strong direct sunlight of more than ten minutes may cause loss of data.

EPROM eraser

The EPROM eraser will erase all the data stored in the EPROM by exposing the integrated circuit through the round window in the card to ultra-violet light.

WARNING

If the internal light can be seen when there is no card present the EPROM eraser is faulty and should be returned.

The EPROM eraser produces an intense ultra-violet light which can only be activated by inserting a Z88 memory card into the eraser; this safety feature prevents any escape of ultra-violet light.

REMOVE FROM MAINS SUPPLY WHEN NOT IN USE.

Never touch the ultra-violet light source. It gets hot in use and may cause burns; also it is made of quartz and will cloud over due to moisture from the skin.

To erase an EPROM

- ① Connect the eraser to the domestic mains supply. The plug should be fitted with either a 1 Amp or a 3 Amp fuse.
- ② Fully insert the EPROM card into the slot on the front of the eraser, with the round hole uppermost. The card is correctly inserted if the white label on the end of the card is visible and the printing "32K EPROM" or "128K EPROM" is upside down.
- The action of inserting the card switches the eraser on. The yellow indicator light on top of the eraser should light and the EPROM will be exposed to ultra-violet light for approximately twenty minutes. After this time the ultra-violet light is automatically switched off and the yellow light will go out.
- After the yellow light goes out, you can remove the card from the eraser. DO NOT REMOVE THE EPROM BEFORE THE YELLOW LIGHT IS OUT. The EPROM card should now be blank and ready for re-use. Removing the card resets the timer, so to erase another card, simply insert it; the yellow indicator light will again be illuminated, and the process can be repeated.

The ultra-violet light source decreases in efficiency with use and eventually a single 20-minute exposure may not completely erase all the data in the EPROM. In this case it may be a good idea to repeat the process a second time to be absolutely sure that it is thoroughly erased.

There is no means of erasing selected individual parts of data from the EPROM. When the EPROM is exposed to the ultra-violet source all data is affected in the same way.

Application cards

Application cards, containing help text, an application, or both, can be inserted into any of the three slots. Note that you must first go to the Index before opening the card flap and inserting the card. When you close the perspex flap, the Z88 should register the new card.

Before removing an Application card, activities using the card must be killed. To do this, enter the Index, and examine the SUSPENDED ACTIVITIES window to see if the number of the card you want to remove appears in the CARDS column. Any activity with the Application slot number next to it is using the card, and should be killed with the OKILL command. The card can then be removed.

Following a **CARD** message, you must replace the card in the same slot and then **OKILL** any applications which are using the card. Following an **INDEX** message, you must return the card to its original slot and close the flap. You must then enter the Index and remove the card in the usual way.

REFERENCE

Section Five – PipeDream reference Setting the options	103 103
Operations on blocks of slots – BLOCKS Marking Replicating slots Copy, Move, and Delete Sorting Searching and replacing Other block operations	104 104 105 108 108 109
Moving about the document – CURSOR Moving anywhere Moving within a line/slot Moving within a column Moving between columns Summary of PipeDream cursor operations	114 114 115 116 116
Editing text and expressions – EDIT Editing within a line/slot Editing within a column Editing a document Editing expression slots	118 119 120 121 123
Working with files – FILES File names Loading a document Saving a document Multi-file documents	125 125 126 127 128
Altering the document layout – LAYOUT Column widths and margins Widths and margins in a multi-column document Alignment Fixing rows and columns Number formats	131 131 132 134 135 136

100 REFERENCE

Document options – OPTIONS Information lines Option lines Text format Recalculation mode Number formats Page format Headers, footers, and margins Margins	138 138 139 140 141 141 142 142
Printing documents – PRINT Highlighting text	146 148
Expression slots Expressions Operators Functions @ Fields	150 150 152 153 158
Section Six – The Diary reference	161
Operations on a block of text - BLOCKS Searching and replacing	162 163
Moving around the Diary – CURSOR Moving within a line Moving within a day Moving between days Active days Summary of Diary cursor operations	166 167 167 168 168 169
Editing the Diary - EDIT Editing within a line Editing within aday Miscellaneous	170 170 171 171
Loading and saving – FILES	172
Section Seven – Filer reference Specifying file names in full Additional Filer commands CLI files	175 175 177 179

Section Eight – The Terminal Control keys Spooling files Transmitting files	185 185 186 186
Section Nine – The Printer Editor Editing the driver definition Highlight codes Printer options PrinterEd FILES menu	187 188 188 191 193
Section Ten - BBC BASIC Entering BBC BASIC Entering keywords Editing BASIC programs	195 196 197 197
BASIC keywords Special Z88 information	199 222
BASIC operators Order of precedence	223 225

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Section Five

PipeDream reference

This section describes all of the PipeDream commands that are available in each menu. To understand this chapter, you should already be familiar with the basic concepts of using PipeDream described in **Section Two – Using PipeDream**.

All commands can be typed directly from the keyboard, as well as chosen from the appropriate menu. The keyboard equivalent for each command is shown to the right of the command name in the menu. For example, the Replicate command on the BLOCKS menu appears as

Replicate OBRE

This means that you can give the Replicate command by typing the \diamond key followed by the keys \blacksquare R E. Note that the letters do not need to be in capitals: \diamond bre has the same effect. Also, you can hold down the \diamond key while typing the letter keys if you prefer.

When, as in this example, the command equivalent is a sequence of two or three letters, the first letter will usually be the first letter of the menu name. For frequently-used commands, the key equivalent is a single letter with the \diamondsuit key (in a very few cases the \square key). For example, the Mark Block command on the BLOCKS menu has the equivalent \diamondsuit Z.

Note that in the following screen diagrams the highlighting bar has been omitted for clarity.

Setting the options

Some commands present you with a table of options which allow you to set up the command to your requirements.

To begin with, the cursor is positioned next to the first option; the cursor keys can be used as normal to move up and down the list.

Many of the options have only two possible alternatives: Yes and No. You can change the value shown either by typing Y or N as appropriate, or by using the Next Option command, ⋄J, which alternates between the available values. In the case of options which take specific values, such as Page Length, Next Option restores the default value.

Operations on blocks of slots - BLOCKS



The commands on the **BLOCKS** menu enable you to manipulate documents to control exactly which areas are affected by a particular operation. A block can include anything from a single slot to a complete document.

Marking

Before giving any block command you identify the slots you wish to operate on using the **Mark Block** command. You can mark a single slot, a row of slots, a column of slots, or a rectangular block of slots spanning several rows and columns.

You identify which block of slots you want to operate on by giving the Mark Block command at the top left-hand corner and bottom right-hand corner of the block. After giving the two Mark Block commands, all the selected slots in the block will be shown highlighted on the screen.

Mark Block - ♦Z

Marks a single slot, or the top left-hand corner and bottom right-hand corner of a rectangular block of slots, to identify the slots to be operated on by subsequent block commands.

Clear Marks - ♦Q

Clears any marked block previously set up with the Mark Block command.

Replicating slots

Replicate - ♦BRE

Reproduces the contents of a slot, or block of slots, in any part of the document. The following options are displayed:

Range to copy from Range to copy to

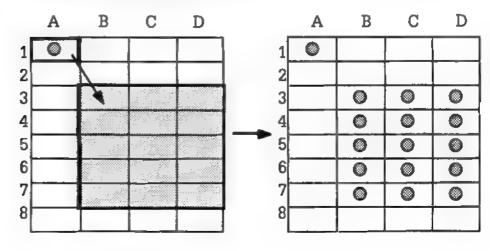
Each range is a block of slots identified by specifying the coordinates of its top left-hand corner and bottom right-hand corner. If necessary, extra rows and/or columns are created in the document to accommodate the new slots.

The ranges can be one of the following forms:

1. Single slot to area

Range to copy from: a single slot, eg A1.
Range to copy to: an area, eg B3 D7, or just a row or column range. The area can include the original slot, if required.

The contents of the slot are copied over the entire area, as represented symbolically in the following diagram:

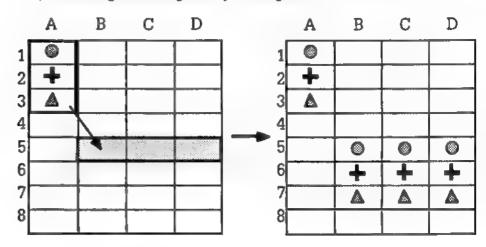


2. Column to area

Range to copy from: a column array, eg A1 A3.

Range to copy to: a single slot or m row array, eg B5 D5.

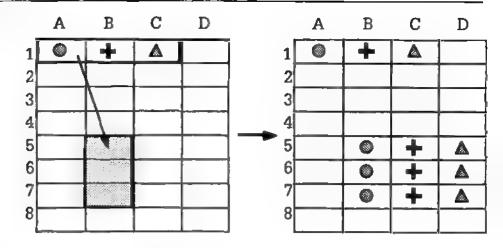
The column is copied to the target column starting at either the single slot, or the range of slots given by the target row.



3. Row to area

Range to copy from: a row array, eg A1C1.
Range to copy to: a single slot or a column array, eg B5 B7.

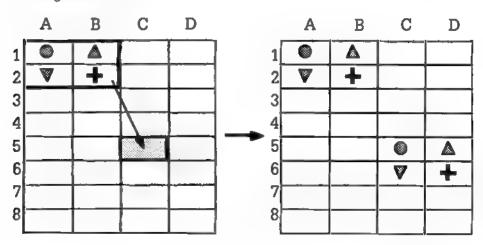
The row is copied to the target row, starting either at the single slot or at the range of slots given by the target column, as shown on the following page:



4. Area to area

Range to copy from: an area, eg A1 B2. Range to copy to: a single slot, eg C5.

The area is copied to the area with the top left-hand corner defined by the single slot.



If the slots contain slot references, the references are updated to take account of their altered position, unless they are fixed with the \$ operator.

Copy, Move, and Delete

Copy - ♦BC

Copies a marked block of slots to the position in the document indicated by the cursor. Slots in the document will be moved apart to make space for the block being copied, in contrast with the Replicate command which overwrites the target area.

Slot references in the new block are updated as for the Replicate command, but references to slots within the block are not altered.

Move - ♦BM

Moves a marked block of slots from its original position to the position indicated by the cursor. All slot references are updated as appropriate.

Note that if you attempt to move a block of slots to a new position which overlaps the same rows or columns as the original block, the error

Overlap

will be displayed.

Delete - ♦BD

Deletes a marked block of slots from the document. Since you will lose the information previously in those slots, it is a good idea to save a copy of your document before deleting a large area, so that you can revert to this if you accidentally delete valuable information.

Sorting

Sort - ♦BSO

Sorts a marked block of slots. Text slots are sorted into alphabetical order, expression slots into numeric order, and date slots into date order. The following options are displayed:

Sort on column
Sort in reverse order No
Don't update references No

Sort on column: set to a column label (A, B, C etc) to specify which column within the marked block should be used to determine the ordering of the slots.

Sort in reverse order: by default, the marked block is sorted into ascending order, and any slot references are updated as appropriate. Setting this option to Yes will sort the specified column in descending order.

Don't update references: setting this option to Yes inhibits the updating of slot references within the block being sorted. This gives a faster sort operation, and can be used provided no slots within the sorted block are referred to either from within or from outside the sorted block.

Searching and replacing

Search - ♦BSE

Search is for a specified string within a single document, or a multi-file document. The following options are available:

String to search for
Search only range of columns No
Equate upper and lower case Yes
Search only marked block No
Search from current file No
Search all files in list No

The string to be searched for is specified in the same way as for the Replace command, and the equivalent options have the same effect; see below.

When the search is completed, a message such as

27 found

will be displayed where 27 is the number of matches since the last **Search** command.

Next Match - ♦BNM

Following a Search command, the Next match command can be used to find the next occurrence of the specified string starting at the current cursor position.

Replace - BRP

Searches for and replaces occurrences of one specified string by another. The following options are displayed:

String to search for
Replace with
Search only range of columns No
Equate upper and lower case Yes
Ask for confirmation Yes
Search only marked block No
Search all files in list No

By default, the **Replace** command replaces all occurrences of the first specified string with the second specified string throughout the current document, equating upper- and lower-case letters and prompting for confirmation before each replacement. For example

String to search	for	Cat
Replace with		Dog

will replace Cat with Dog, cat with dog, and CAT with DOG.

On each occurrence of the search string, the prompt

Replace: No Y?

will be displayed at the top of the screen. Answer Y to perform the replacement, N to proceed to the next occurrence of the search string, or press the <code>[ESC]</code> key to cancel the command. When the command is completed, the message

27 found

(or as appropriate) will be displayed to show the total number of replacements that have been made.

String to search for: specifies the search string, which can be up to 240 characters in length.

Certain special sequences of characters can be used in the search string to represent characters which cannot be typed at the keyboard, or classes of search string:

Sequence	Matches
^1^8	Highlight character
$\wedge \wedge$	^ -
Λ?	A single character – not space
^ #	Any number of non-space characters (ie ■ word)
^S	A space
^Rref	Slot reference ref
^R#	Any slot reference
space	One or more spaces, or across slots
^B	Beginning of a slot (or line)

Replace with: specifies the string to replace each occurrence of the search string. The following special sequences of characters can be used:

Sequence	Substitutes
^1^8	Highlight character
۸۸	Λ -
^?n	Character matching nth ^? in search
^#n	String matching nth ^# in search
^S	A space
^Rref	Slot reference ref
^R#n	Slot reference matching nth ^R#
space	Matching spaces or slot boundary

Up to nine ^? fields, nine ^# fields and nine ^R# fields, numbered 1 to 9, can be used in the same replace string.

The "# wild field will match zero characters, as long as the string which has been searched for contains at least one character (otherwise the wild field would match all spaces).

Search and Replace examples

The sequences ^1 to ^8 represent highlight codes 1 to 8. For example, all occurrences of PipeDream could be put into bold with the options

String to search for PipeDream ^2PipeDream^2

The sequence ^B forces the search string to start at the beginning of a line. For example, all single spaces could be removed from the beginnings of lines with the options

String to search for Replace with

^B^S

The sequence ^# will match a sequence of characters not containing a space; ie a word, or a number. For example, to strip line numbers from spooled BASIC programs:

String to search for Replace with ^B ^#

Where ^# or ^? have been used to search for any words or characters, the words or characters that were found can be inserted in the *Replace with* string using ^#1 to ^#9, or ^?1 to ^?9 respectively. For example,

String to search for Replace with

c^?r^? ^?2^?1 ck

will change cart to tack and cord to dock.

The sequence ^Rref and ^R# respectively match a specific slot reference, and any slot reference, in an expression slot. Thus,

String to search for Replace with

^R# ^R#1+1

will replace all slot reference A1 by A1+1, and so on.

Search only range of columns: enables you to specify a column range by entering a pair of column labels separated by a space: eg A G. The command is then restricted to the specified range of columns, inclusive.

Equate upper and lower case: by default, upper- and lower-case letters are treated as equivalent in the search string and the cases of letters in the replace string are altered to match the cases of the letters in corresponding positions of the matched string. Setting this option to No forces matches to be identical case. This means that, for example, specifying Dog to replace Cat will have no effect on cat or CAT.

Ask for confirmation: setting this option to No causes all strings to be replaced without prompting.

Search only marked block: setting this option to Yes restricts the search to a marked block of slots.

Search from current file: setting this option to Yes performs the search and replace operation throughout a multi-file document, starting at the top of the current file.

Search all files in list: setting this option to Yes performs the search and replace operation throughout a multi-file document, starting at the top of the first file. See **Multi-file documents**, p. 128.

Other block operations

Word Count - ♦BWC

Counts the words in the whole document, or in a block of slots if one has been marked, and displays the number of words, for example

127 words

at the top of the screen. Note that numbers and other symbols separated by spaces will contribute towards the word count.

New - OBNEW

Clears the entire document. The query

Overwrite text?

is given. If you clear the document (by answering Yes), this will cancel all file names and multi-file mode, resetting the Options Page options to their defaults, and resetting the screen display to its starting state of six columns, each 12 characters wide.

Recalculate - ♦A

Recalculates all expression slots throughout the entire document. The order of recalculation is determined by the columns/rows Options Page setting.

Moving about the document - CURSOR



The commands on the **CURSOR** menu aim to provide the greatest possible flexibility for moving around a document. Because they are used so frequently, many of them have simple shorthand equivalents, which can save you a lot of time.

You can move to the left or right a character, word, or column at a time, or to the start or end of a slot, or to the first or last column.

You can move up or down the document a row at a time, a screenful at a time, or to the top or bottom of the column.

You can also go directly to a specified slot by giving its coordinates.

The commands on the CURSOR menu do not modify the document in any way, with the exception of the ENTER command which will add a blank row at the bottom of the document if the cursor was previously at the bottom of the document.

Moving anywhere

Go to Slot - ♦CGS

Moves the cursor directly to a specified slot. After the prompt

Go to slot

type the coordinates of the slot you want to move to, followed by ENTER. If the slot you specify is off the document, the cursor will be moved as far as possible in the direction of the specified slot.

Save Position - ♦CSP

Saves the cursor position of the line containing the cursor in PipeDream. If you move to a new position, you can jump back to the previous position with the **Restore Position** command. Up to five positions can be saved.

Restore Position - OCRP

Moves the cursor to the last position saved. If five positions have already been saved, the **Save Position** command will give a bleep warning.

Moving within a line/slot

Cursor Right - □ Cursor Left - □

Moves the cursor to the next character in the slot, or the previous character in the slot respectively. Cursor Left will have no effect once the cursor reaches the beginning of the slot. Cursor Right will continue to move the cursor beyond the end of the slot, scrolling the slot left if it reaches the wrap point for the column.

Next Word - SHFT ▷
Previous Word - SHFT ▷

Moves the cursor to the first character of the next word in the slot, and the previous word in the slot respectively. If there are no more words in the current slot, Next Word will move the cursor to the first character of the next slot. Likewise, if the cursor is at the beginning of a slot, Previous Word will move the cursor to the end of the previous slot.

Beginning of Line - 💠 🗘

Moves the cursor to the first character position in the slot.

End of Line - ♦□

Moves the cursor to the position after the last character in the slot.

Moving within a column

ENTER - ENTER

Moves the cursor down to the next row and to the first character position in the current column. If the cursor is at the bottom of the document, the command will add an extra row to the document.

Cursor Up $- \bigcirc$ Cursor Down $- \bigcirc$

Moves the cursor to the same horizontal position in the previous line and the next line respectively: the cursor remains in the current column. Cursor Up will have no effect if the cursor is already on the top line of the document, and Cursor Down will have no effect if the cursor is already on the bottom line of the document.

Screen Up - SHIFT 1 Screen Down - SHIFT U

Moves the cursor up or down a screenful at a time. With borders displayed this will be five lines at a time.

Top of Column $- \diamondsuit \bigcirc$ Bottom of Column $- \diamondsuit \bigcirc$

Moves the cursor to the top or bottom of the current column in the document respectively.

Moving between columns

First Column - ♦ CFC or ♦ TAB

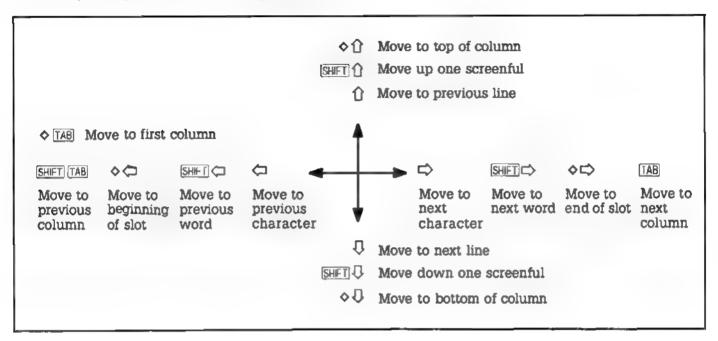
Last Column - ♦ CLC

These commands move the cursor to the first or left-most column on the document, and last or right-most column on the document respectively. The cursor stays in the same row, but will be moved to the first (left-most) character position in the specified column.

Next Column - TAB Previous Column - SHFT TAB

Moves the cursor to the next column on the right, or the previous column on the left, respectively. The cursor remains in the same row, but moves to the beginning of the slot in the new column.

Summary of PipeDream cursor operations



Editing text and expressions - EDIT

PIPEDREAM Rubout BLOCKS CURSOR Insert Character EDIT Delete Word FILES Delete to End of Delete Row OPTIONS FRINT ESCAPE	Slot of Slot	Insert/Overtype Swap Case Next Option Edit Expression Insert Reference Number(>Text Format Paragraph	◆U ◆S ◆J ◆X ◆K ◆ENT ◆R		OESL OEJL ColumnOEDRC ColumnOEIRC OEIC OEAC OEAC	MEMINADOR POPULAR POPU	OZ
---	--------------	--	--	--	--	--	----

The commands on the **EDIT** menu provide for various modifications on the contents of document. In the first place, there are commands which allow you to delete a character, word, slot, row or column on the document.

You can also insert a row or a column, join two slots or split a slot, and insert a page break.

Some of these commands are especially useful when working with multi-column documents: see Widths and margins in a multi-column document, p. 132

The remaining commands are divided into two groups; the first applies specifically to working with text, the second to working with expression slots:

Format Paragraph reformats a paragraph of text within a column, Swap Case swaps the case of a single character, and Insert/Overtype changes PipeDream between Insert and Overtype text entry modes.

Edit Expression allows you to enter an expression, Number to Text converts between an expression slot and a text slot and Insert Reference inserts a slot reference into an expression.

Editing within a line/slot

Insert/Overtype - $\Diamond V$

Switches the text entry mode between Insert and Overtype. The mode currently selected is displayed on the top line of the Options Page.

In **Insert mode**, characters typed are inserted at the cursor position, and subsequent text on the line moves apart to make space.

In **Overtype mode**, characters type over any text previously on the same line, in the same way as a correcting typewriter works.

The mode you choose to work in is a matter of personal preference. The selected mode is specific to each PipeDream suspended activity; the default mode can be set in the Panel.

Rubout - DE

The Rubout command, normally used by pressing the DEL key, deletes to the left. The DEL key is used to remove a mistake in the line you have just typed. In Insert mode the remaining characters on the line move one position to the left. Note that DEL will not jump back to the previous line when the left-hand margin of a page is reached.

Delete Character - OG or SHIFT DEL

Deletes to the right. You would normally use the **Delete Character** command to delete one or more characters in the middle of a line of text.

Insert Character - OU

Inserts a space at the cursor position, leaving the cursor where it is and moving subsequent text on the line to the right. The **Insert Character** command is used when working in Overtype mode, to create spaces in which to insert additional text within a line.

Delete Word - ♦T

Deletes all the characters from the current cursor position, up to but not including the first character of the next word. Normally you would position the cursor at the beginning of the word you want to delete, using the Next Word and Previous Word commands, and then give the Delete Word command to delete everything up to the next word. Note that Delete Word will not delete beyond the end of the current slot.

Delete to End of Slot - OD

Deletes all characters from the current cursor position to the end of the slot.

Swap Case - \$S

Changes the case of the character under the cursor, and moves the cursor one position to the right.

Editing within a column

Delete Row in Column - &EDRC

Deletes the slot containing the cursor and closes up the gap, so that subsequent rows in the current column move up on the document. This command will typically be used when PipeDream is operating in Columns mode, so that the text in the current column does not have to remain aligned with the text in adjacent columns.

Insert Row in Column - ¢EIRC

Inserts a row in the column containing the cursor. Subsequent rows in the current column are moved down to make space. The Insert Row in Column command is typically used when working in Columns mode, as it does not affect the text in columns to either side of the column containing the cursor. It is also useful for restoring the alignment of a table containing items in different columns.

Join Lines - ♦EJL

Joins the text in the line below the current line onto the end of the current line, and closes up the gap so that subsequent slots in the current column are moved up one row.

Split Line – ♦ESL

Splits the current line at the cursor position. The character at the cursor position and subsequent characters are moved to the next row and the cursor remains at the end of the current slot.

Format Paragraph – ♦R

Reformats text from the line containing the cursor to the end of the paragraph. The lines of text will be split at the last space before the

right-hand margin for the current column; see **Starting PipeDream**, p. 32. If justification has been selected, with the Options Page *Justify* option (see p. 140), additional spaces will be added to each line to make the right-hand end always coincide with the wrap point. The end of the paragraph is determined by one of the following:

A line beginning with at least one space

An expression slot

A slot with alignment other than free align; in other words, left align, right align or LCR align.

You can prevent words from being split at a space by typing \diamond space, which is called an 'exact space' and is displayed on the screen as '...'. For example,

27...KHz

Editing a document

Delete Row - OY OF OR

Deletes the row containing the cursor across the entire document, closing up the gap. This command should be used with care, since the slot in every column on the current row will be deleted. The command is typically used when PipeDream is operating in Rows mode, in order to maintain alignment between text in adjacent columns.

Delete Column - ♦EDC

Deletes the column containing the cursor. Note that all information in the column will be lost, so use this command with caution.

Insert Page - ♦EIP

Normally, page breaks are inserted automatically by PipeDream. These are called 'soft' page breaks, and are represented by a horizontal line

^^^^^^

across the document between two rows. Their position will change if you alter the amount of text on a page, or change the margin settings on the Options Page.

However, to force a page break to occur at a specific place in the document, such as before a new chapter, you can insert a 'hard' page break with the **Insert Page** command. Hard page breaks are displayed as a row on the document

Using this command will insert a hard page break in the row containing the cursor. The command gives the prompt

Specify no. of unbroken lines No.

Pressing ENTER executes the command, thereby ensuring that subsequent text will always start at the top of a new page.

Alternatively, altering the option to Yes followed by a number enters a conditional hard page break. This means that a page break will occur if less than the specified number of lines is available on the current page. For example, before a table of ten lines one might insert a conditional hard page break with a value of 10 to ensure that all ten lines of the table were on the same page.

If the conditional hard page break does not cause a page break, it will be displayed in column A as:

ት ከ

Insert Row - ♦N

Inserts a blank row across the entire document before the row containing the cursor. Subsequent rows are moved down to make space. The **Insert Row** command is typically used when working in Rows mode (see the Options Page), since it maintains alignment between text in adjacent columns.

Insert Column - ØEIC

Inserts a blank column to the left of the column containing the cursor. The new column is created with an initial width of 12 characters, and an initial wrap-width of zero. The cursor remains in the new column.

Add Column - ♦EAC

Adds a blank column at the right-hand side of the document. The new column is added with an initial width of 12 characters, and a wrap-width of zero so that text in the new column will wrap at the right-hand edge of the column.

Editing expression slots

Insert Reference - ♦K

Enables expressions to be built up by indicating, or 'pointing to', various slots to which an expression will refer. It inserts the coordinates of the slot containing the cursor into the expression being edited. To perform the command, move the block cursor to the required slot using the cursor keys, and type $\Diamond K$.

II an expression is not being edited, this command will have no effect.

Edit Expression - ♦X

Sets the slot containing the cursor to an expression slot, or edits an existing expression slot.

The slot is highlighted, and the cursor moves to the editing line above the top border at the centre of the screen. The current contents of the slot, if any, are displayed, and they can be edited using the cursor keys and line editing commands:

DEL	Rubout
SHIFT DEL	Delete character
ΦV	Insert/Overtype
♦U	Insert character
ΦT	Delete word
♦D	Delete to end of slot
♦ K	Insert reference
$\langle \Box, \Box \rangle$	Cursor left/Cursor right
SHIFT CO. SHIFT C>	Previous word/Next word
♦	Beginning of line/End of line

Finally press ENTER to enter the expression into the slot and display its value, or ESC to leave the slot's previous value unaltered.

Escape - ESC

Exits from the Options Page, or from the options of any PipeDream command. ESC will also abandon the editing of an expression and leave the contents of the slot being edited unchanged.

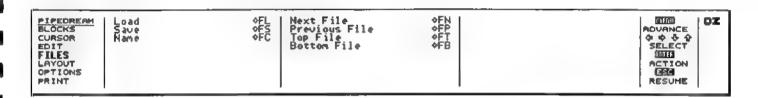
Number < > Text - OENT

Converts the slot containing the cursor between an expression slot and a text slot. This command allows a number inadvertently entered as text to be converted to an expression, or the equation in an expression slot to be displayed as text so that it can be printed out.

The following procedure can be used to display, or print out, all the expressions within a particular area of a spreadsheet or document:

- ① Save the document first, as the procedure will alter it.
- Mark as much of the document as you wish to examine or print out.
- Type ◆ENT. Expression slots within the marked block will display the expressions they contain. Note that text slots will display the error Typing error.
- ◆ Press ◆Q to clear the marked block, and, if necessary, increase the column widths so that the full expressions can be seen.

Working with files – FILES



The commands on the FILES menu allow you to load documents from the Z88 filing system, and save documents to the filing system.

You can create a document consisting of several files linked together by a List file. Commands are available to move to the next file or previous file, or go directly to the first file or last file in a multi-file document.

For simple use of PipeDream you do not need to use files, since you can leave documents you are working on as suspended applications. However, since there is a small overhead in keeping suspended applications, saving a large number of small documents as files will prevent the inconveniences of memory low conditions.

File names

When you start PipeDream with a blank document, the document will have no File name associated with it, and it will show:

File No File

at the top right-hand side of the Options Page. A File name can be given to a document with the Name command. Loading a file, with the Load command, will set the File name to the name of the loaded file.

The File name of the document is displayed in the Options Page, and is used as the default file name in the options for the **Save** and **Name** commands. The File name is also used to label PipeDream suspended activities, in the Index YOUR REF. column.

Name - OFC

Sets the File name for the current document. Gives the prompt:

New name of file

The current File name, if any, will be displayed; this should be edited to the new name, followed by INTER.

Loading a document

Load - OFL

Loads a document of a given name from the filing system. The following options are displayed:

Name of file to load
Insert at slot No
Limit to range of rows No
Load as plain text No

Name of file to load: specifies the file name. If a file of the same name but with the extension '. L' exists, this file is taken as a List file; see Multi-file documents, p. 128. If not, the specified file is loaded.

The File name, displayed in the Options Page, will be set to the name of the file loaded. In the case of a multi-file document, this will be the name of the current document, not the name of the List file.

Instead of typing the file name, the file can be selected from the Filer. After typing OFL, call the Filer by typing OF, and select the required document using the cursor keys followed by ENTER (see Selecting files, p. 83). You can then return to PipeDream from the Filer by pressing ESC, and the full file name will have been entered for you. Press ENTER to load the file.

If the document in memory has been altered since last saving it, the message

Overwrite text?

will be displayed, and the document will only be loaded if Y (or y) is typed. If the document is too large to fit into memory, only the first section will be loaded, and the display will show the message

Memory full

Insert at slot: appends the file to the document already in memory, either at the specified slot reference, or at the current cursor position if no slot reference is specified. Type Y for the option

Insert at slot

Yes

and enter a slot reference.

Limit to range of rows: enables files too large for the available memory to be edited by splitting them up into sections. If the option is set to Yes, a range of rows can be entered as two numbers separated by a space. Only rows lying between the specified range, inclusive, will be loaded.

Load as plain text: if Yes is specified, the file is interpreted as plain text. Sections of text on each line separated by tabs are put into successive columns across each row of the PipeDream document.

After loading a document, expression slots are recalculated twice, once to obtain the correct values of constant slots, and then again to ensure that references to constant slots have the correct values. If the document contains complicated forward referencing, it may need further recalculation before the values of slots stabilise.

Saving a document

Save - OFS

If none of the options are changed, pressing NIH saves the whole of the current document to the name last set by the **Load** or **Name** commands.

The following options are displayed:

Name of file to save
Save only range of columns
Save selection of rows
No
Save marked block
No
Save plain text
No

Name of file to save: by default, the current File name is displayed, as shown in the Options Page. This can be edited to save the document under a different name.

Save only range of columns: altering this option to Yes allows you to specify a range of columns. This should be given as two column labels, separated by a space: for example, A.F. Only the text within the range of columns, inclusive, will be saved.

Save selection of rows: altering this option to Yes allows you to enter an expression. Only rows for which the expression evaluates to TRUE will be saved.

For example, column E in an inventory of goods may represent the quantity of each item in stock. To save a copy of the database which excluded out-of-stock items, you would type

Save selection of rows

Yes E1>0

All row references in the expression are incremented before the expression is evaluated for each row in the document. So in this example row 6 will be saved if E6>0.

Save marked block: altering this option to Yes specifies that only the marked block of text should be saved.

Save plain text: altering this option to Yes will save the document as a plain text file, containing no special constructs. The contents of each successive column will be output separated by tab characters, with each row terminated by a return character.

Multi-file documents

Documents comprised of several different files can be edited and printed as a single document by means of a PipeDream List file.

The List file is a plain text file containing the names of all the files making up the entire document. It should be saved with the Save plain text option, with each file name on a separate line.

The List file should be given a name with the extension '.L'. A file with extension '.L' is taken as a List file when loading, and the first document in the list will be loaded.

Any error which occurs during the processing of a multi-file document cancels the multi-file mode after reporting the error, to avoid overwriting files with incorrect text.

The following commands provide a convenient way of moving between files in a multi-file document:

Next File - OFN

Loads the next file in ■ multi-file document, but first saves the current file if it has been altered since the last save command.

Previous File - OFP

Loads the previous file in ■ multi-file document. The current document is saved if it has been altered since last saving it.

Top File - ♦FT

Loads the first file in a multi-file document. The current document is first saved if it has been altered since last saving it.

Bottom File - OFB

Loads the last document in a multi-file document. The current document is first saved if it has been altered since last saving it.

Multi-file example

For example, first create a List file in PipeDream, containing the following text:

A3

Chapterone
Chaptertwo
Chapterthree
End of text

Take care not to add any blank lines after the last file name. Then save this as a plain text file called book.L, by typing \$\rightarrow\$F\$ book.L, and setting the Save plain text option to \$\rightarrow\$.

Create three files, chapterone, chaptertwo, and chapterthree, containing, for example, the following lines of text respectively:

This is the first chapter

This is the second chapter

This is chapter three

Now load the multi-file document by typing $\diamond FL$ book. If you use the Filer to select the file you will need to delete the '.L' extension from the end of the file name.

Typing \$\phi FN, \$\phi FP, \$\phi FT, and \$\phi FB\$ will then move between the three files.

Altering the document layout - LAYOUT



The commands in the **LAYOUT** menu allow you to specify how the information entered in a document is displayed.

You can alter the width that any column occupies, and the column's right-hand margin, which determines the point at which lines of text entered into that column wrap onto the next line.

You can also fix rows above the cursor position and columns to the left of the cursor position so that you can see information on one part of the document while editing information on another part.

Column widths and margins Wid

Width - OW

Specifies the width that a column occupies on the document. The following options are displayed:

New width Specify column

Νo

If no column is specified, the column currently containing the cursor is assumed.

Set Margin - ♦H

Alters the right-hand margin of a specified column. The margin is indicated by the right-hand margin pointer, \downarrow , on the top border, and determines the point at which text typed into the column will wrap onto the next line.

This command determines the area over which text is to be formatted within the column; thus, if the width is set to zero, it will be equal to the column width, and there will be no margin. The following options are displayed:

New width Specify column

Νo

II no column is specified, the column containing the cursor will be assumed.

Margin Left - □ < ☐ Margin Right - □ <

These commands allow you to move the right-hand margin for a number of columns simultaneously.

The commands move the right-hand margin pointer, \downarrow , for the column containing the cursor one character position to the left or right respectively. They also set the wrap point of all columns between the current column and the wrap point so that they wrap at the same position.

Widths and margins in a multi-column document

By default, the wrap point for all columns is set to the right-hand edge of the screen, which is most appropriate for creating tables of information within a single column of text. The **Insert on wrap** option on the Options Page is initially set to Rows, ensuring that information in adjacent columns will remain aligned.

It is also possible to create a document with two or more independent columns of text, like the layout of a newspaper.

You do this by moving the right-hand margin for each column to the right-hand edge of the column. Setting the **Insert on wrap** Options Page option to Columns will then ensure that the text in each column can be edited without affecting adjacent columns.

For example, the following steps can be used to create the three-column document shown below.

Set the widths of columns A, B, and C to 24, by giving the Width command on the LAYOUT menu with the options

New width	24
Specify column	Yes A
New width	24
Specify column	Yes B
New width	24
Specify column	Yes C

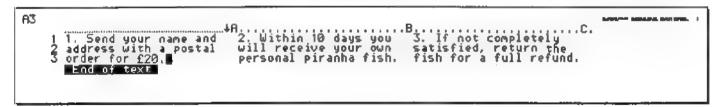
- With the cursor in column A, move the right-hand margin to the right-hand edge of column A by pressing □ □ until the right-hand margin pointer is just to the left of the A on the top border; see the diagram below. This will also position the left margin for columns B and C to the right-hand edge of those columns.
- ⑤ Enter the Options Page, by typing ⋄O, and alter the Insert on wrap option to Columns by pressing Ū until the cursor is on the option line, and typing C to alter it to

Insert on wrap

C

Press ESC to exit from the Options Page.

Type the required text into each column; it will format automatically within the column width.



Alignment

Text can be aligned in one of the following ways:

- ① Left-aligned with the left-hand edge of the column.
- ② Right-aligned with the right-hand margin pointer.
- ③ Centred between the left-hand edge of the column and the right-hand margin pointer.
- Omponents of the line can be left-aligned, centred, and right-aligned (LCR alignment).

Text in a slot which has been aligned with one of the Align commands will not be reformatted by the Format Paragraph command.

The results of expression slots can similarly be displayed left-aligned, centred, or right-aligned over the width of the column.

Right Align - ♦ LAR Left Align - ♦ LAL

Aligns the text in the current slot to the right or left of the wrap-width of the current column, respectively. The alignment will be displayed when the cursor is moved off the slot. The **Left Align** command can, for example, be used to prevent text in a table from being inadvertently reformatted with the **Format Paragraph** command.

Centre Align - ♦ LAC

Centres the text in the slot containing the cursor, or a marked block of slots, over the wrap-width of the column containing it.

LCR Align – ♦ LLCR

Aligns components of the slot containing the cursor, or the slots within a marked block, to the left, centre, and right of the column's text wrapwidth. The line has the format

/left/centre/right/

where left, centre, and right represent text which will be respectively left-aligned, centred and right-aligned, and '/' represents an arbitrary delimiter, which must not occur elsewhere in the line of text.

Free Align - \$ LAF

Removes the alignment from a slot containing the cursor, or a marked block of slots. Text, or the results of expression slots, will be left-aligned in the slot.

Fixing rows and columns

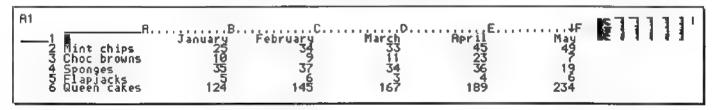
Fix Row - O LFR

Fixes the row containing the cursor, and all rows above it, on the screen. If borders are displayed, the fixed rows are identified with horizontal lines in the left-hand border. Moving the cursor up or down on the document will scroll only those rows which have not been fixed, so the cursor can be moved to another part of the document while retaining the fixed rows on the screen. Giving the Fix Row command again frees the rows and restores the document to its original state.

Fix Column - OLFC

Fixes the column containing the cursor, and all columns to its left, on the screen. If borders are displayed, the fixed columns are identified in the top border by solid lines. If the cursor is moved on the document, only the columns that have not been fixed will scroll, so that the cursor can be moved to another part of the document while retaining the fixed columns on the screen. Giving the **Fix Column** command again frees the columns.

For example, the top row of headings and leftmost column of labels have been fixed in the following document by giving the commands \diamond LFR and \diamond LFC with the cursor in slot A1:



The cursor can then be moved around to scroll the document while keeping the column headings and row labels in view.

Number formats

Expressions can be displayed with a specified number of decimal places, or in free format. Negative numbers can be displayed either with a minus sign, or with brackets as in financial notation. The results of expression slots can also be displayed with one or more leading characters, such as '£' and one or more trailing characters, such as '%'. The leading and trailing characters for the document are specified in the Options Page.

The format in which any expression slot is displayed can be restored to the default specified in the Options Page by the **Default Format** command.

All the format commands can be applied either to the single slot containing the cursor, or to a block of slots by marking them before giving the command.

Decimal Places - OLDP

Sets the number of decimal places displayed by an expression slot, or a marked block of expression slots. Gives the prompt

Number of decimal places Floating format

No

The number of decimal places may be set to a value from 0 to 9, or floating format may be specified which uses the display format giving the most significant figures displayed in the available width.

Sign Brackets - ♦LSB Sign Minus - ♦LSM

Specify that negative values in an expression slot or marked block of expression slots should be displayed in financial notation, enclosed in brackets, or with a minus sign prefix respectively.

Leading Characters - ♦LCL Trailing Characters - ♦LCT

Specify that the leading or trailing characters defined in the Options Page should be displayed for the expression slot contained in the cursor or the marked block of expression slots. The default leading and trailing characters are '£' and '%' respectively, and these can be altered on the Options Page.

Default Format - OLDF

Restores the expression slot containing the cursor, or a marked block of expression slots, to the default format as specified on the Options Page. Once any element of an expression slot's format has been altered with one of the commands Decimal Places, Sign Brackets, Sign Minus, Leading Characters or Trailing Characters, the slot's format is frozen and will not be affected by subsequent alterations to the Options Page. Giving the Default Format command removes any specific format set on the slot.

Document options - OPTIONS



The **OPTIONS** menu contains only one command, **Options Page**, or \diamond O, which displays a page of information about the current document together with the global settings which may be altered to effect the way that commands operate on the document.



You can return to a PipeDream document by pressing the ESC key.

Information lines

The right-hand column of the Options Page display gives information about the current document.

File

The name of the document previously loaded with the **Load** command, or the name assigned to a document by the **Name** command (\diamond FC) on the **FILES** menu. If no name has been specified, it will show

No File

The name will also appear on the SUSPENDED ACTIVITIES list in the Index display.

Page

Shows the current page number of the line containing the cursor. This will correspond to the page numbering when the document is printed unless rows are fixed with the **Fix Row** command on the **LAYOUT** menu, or the Options Page page-length setting has been set to zero.

Insert/Overtype

Shows the current text entry mode selected by the Insert/Overtype command on the EDIT menu. The mode initially selected is Insert mode.

Microspace

Normally blank, displays the word Microspace option has been selected from the **PRINT** menu.

Free

Displays the amount of space remaining for characters in the current document, to the nearest multiple of 256 characters. It is inadvisable to continue typing text into a document if there are less than approximately 300 free characters. In such a situation you are advised to make space in memory by freeing activities, or deleting files.

Option lines

This page is used to determine how text and expressions are displayed in a document (including the default setting for the display of expression results) and to set up the layout of a document ready for printing, specifying headers and footers, and margins at the top, bottom and left of the page. In addition, you can control the length of the page, the spacing of text, and the page numbering.

Altering options - Next Option

As with many other commands, Next Option, $\lozenge J$ will alternate between two available values, for example \curlyvee and \LaTeX for \curlyvee and \between or \intercal and \between for \intercal and \between and \between and \between and \between are \between . Alternatively, these values can be changed by typing the appropriate letter. In the case of options with more than two possible values, $\lozenge J$ will set the option back to its default value.

Other options can be altered by moving the cursor to the appropriate item, with the Ω and Ω keys, and then editing the item with the line-

editing commands \(\sigma\), \(\sigma\). (Eq. key and \(\phi\) G or SHFT (DEL) to delete the character under the cursor. In numeric fields, such as Page length, Overtype mode is automatically set irrespective of the current Overtype/Insert mode setting.

In the following list of options the default value is shown against each option.

Text format

Determines the formatting of text in the document.

Text/Numbers (T)

Set to T (Text) to make the default slot format text slots, or N (Numbers) for expression slots. In Numbers mode there is no need to type $\Diamond X$ before entering an expression, and the cursor keys \Box and \Box will move directly between slots containing expressions; ie behave like TAB and SHFT TAB.

Borders (Y)

Set to Y (Yes) to display borders, or N (No) to hide borders. Hiding the borders allows a larger area of the sheet to be displayed, and can be useful for word-processing applications.

Justify (N)

Set to N (No justify) for ragged right margins, or Y (Yes) for even right-hand margins. To reformat a paragraph of text after changing this option, give the Format Paragraph command, $\diamond R$.

Wrap (Y)

Set to Y (Yes) to make text wrap automatically at the wrap point, or N (No) for no wrapping.

Insert on wrap (R)

Set to R (Rows) to maintain alignment between adjacent rows, or C (Columns) for creating independent columns of text; see Widths and margins in a multi-column document, p. 132.

Recalculation mode

The Calc options determine how expression slots are recalculated in the document.

Auto/Man (A)

Determines the recalculation of expression slots on the document.

Set to A (Automatic) to recalculate the document every time an expression slot changes or M (Manual) for recalculation only with the \diamond A command. This option can be set to M to make entering data into a large spreadsheet, or working with large text documents, faster.

Columns/Rows (C)

Select the order of recalculation: R (Rows) across rows first, or C (Columns) down columns first.

Number formats

Determine the default display format for numerical expression slots.

Decimal places (2)

Select 0 to 9 decimal places or F for free format.

Minus/brackets (M)

Select M (Minus) to display negative numbers with a minus sign, or B (Brackets) for financial bracketed notation.

Lead chs. (£) Trail chs. (%)

Specify up to 4 characters to be displayed in front of or after expression slots with \diamond LCL or \diamond LCT set.

Page format

Determines the spacing and pagination of the document when printed.

Page length (66)

Set to between 1 and 127 to specify the number of lines on each page. including margins, footer and header, or 0 to suppress page breaks altogether.

Line spacing (1)

You can specify from 0 to 255 additional blank lines to be inserted between each line of text.

Start page

You can set the current page number to 0 to 255.

Headers, footers, and margins You can specify an additional header or footer line of text to appear at the top or bottom of each printed page respectively. Each line of text can consist of up to three components, which will be left-aligned, centred, and right-aligned.

> The left margin, and the margins above and below the header and footer, and between the header and footer and the page of text, can be separately altered to determine the layout of the printed page.

> Note that if a header or footer are specified, the number of lines of text on each page will be reduced accordingly.

	Top Margin	
	Header Text	
	Header Margin	
Left margin	Page of text	
	Footer Margin	
	Footer Text	
	Bottom Margin	

The complete page layout, with headers and footers and their associated margins, will be represented on the page map display at the right-hand side of the PipeDream screen.

Header Footer

You can specify lines of text which will be printed out at the head and foot of each page. Each line has the format

/left/centre/right/

where left, centre, and right represent text which will be respectively left-aligned, centred and right-aligned, and '/' represents an arbitrary delimiter, which must not occur elsewhere in the line of text.

Title

A line of up to 244 characters can be entered in this field as a title for the document. The title can be included in the document, or in the footer or header, by giving the @T@ field; see p. 158.

Margins

You can specify the number of blank lines, from 0 to 255, to be left above the header, between header and text, between text and footer, and below the footer respectively. The left margin can specify a margin of 0 to 255 characters at the left of each page:

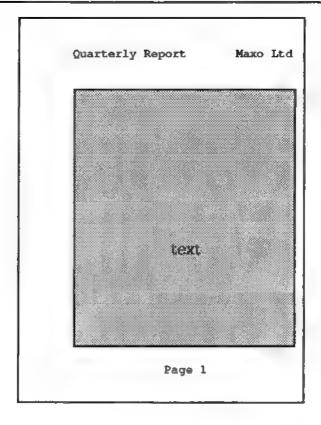
Margins: Top 0
Header 2
Footer 2
Bottom 8
Left 0

For example, a typical set-up might be

Margins: Top 2
Header 2
Footer 2
Bottom 2
Left 6
Header /@T@//Maxo Ltd/
Footer //Page @P@//

Title Quarterly Report

The @-field @P@ will be replaced by the current page number, and the @-field @T@ by the Title. The resulting page layout would be as follows:



Printing documents - PRINT

PIPEDREAM Print OPN BLOCKS Microspace Pitch OPN CURSOR EDIT FILES LAYOUT OMTIONS PRINT	Underline OPU Bold OPB	Insert Highlights OPHI Remove Highlights OPHR Highlight Block OPHB	ADVANCE \$\phi \phi \phi\$ SELECT SUID ACTION GEO RESUME
--	--	--	---

The commands on the **PRINT** menu allow you to print your document and to take advantage of facilities offered by the printer, such as bold and underlined text, and alternative fonts.

Print - OPO

Prints all or part of a document. The following options are displayed:

Print only range of columns	No
Select rows to print	No
Wait between pages	No

By default, the **Print** command prints the whole of the current document with no pause between pages.

The starting page number is determined by the Options Page Start page setting, except when printing a marked block, or selected rows. In this case the pages will be numbered, starting at 1, and soft page breaks will be ignored.

Print only range of columns: setting this option to Yes will allow a column range to be specified. The column range should be given as two column labels, separated by a space. Only the columns within the specified range (inclusive) will be printed.

Select rows to print: setting this option to Yes will allow an expression to be entered. Rows will only be printed if the expression evaluates to a true or non-zero result. The expression can contain slot references; after each row the slot references are updated by one row, unless they are fixed with the \$ operator.

For example, a document containing text in column E could use column A to contain a '*' character, indicating the latest revisions to the document. To print out only the revised lines the option

Select rows to print

Yes A1="*"

could be specified. See also **Printing selected rows**, p. 54, for an example.

Wait between pages: setting this option to Yes gives a prompt between pages to allow single sheets to be inserted into the printer. The prompt

Page n ...

is displayed, where \cap is the page number. You can then press one of the following keys to control printing:

M to miss the page

C to continue printing all remaining pages without further prompting Any other character (eg the space bar) to print the page ESC to abandon printing.

Printing a marked block: if a block of slots is marked when the Print command is given, only the marked slots will be printed.

Multi-file documents: if the Print command is given in a multi-file document, the current document will be saved if it is modified, and the entire multi-file document will be printed, starting with the first file.

Microspace pitch - ♦PM

Selects microspaced printed output. Gives the prompt

Microspace printed output

Nο

Changing the option to Yes and pressing ENTER causes subsequent output to be microspaced at the default spacing of 12/120ths of an inch, giving a pitch of 10 characters per inch. A number can be entered to specify an alternative spacing. For example, entering 10 gives 12 characters per inch. Microspace is displayed at the top right-hand corner of the Options Page display if it has been selected.

Highlighting text

You can alter the style of text in your document by inserting one of eight highlight codes in front of the text, and the same code after the text to revert back to normal.

Highlight codes

The recommended assignment of the eight codes is as follows:

Code	Function	Printed example		
1	Underline	underlined type		
2	Bold	bold type		
3	Extended sequence	έçπ		
4	Italic	italic type		
5	Subscript	н,0		
6	Superscript	e=mc²		
7	Alternative font	alternative font		
8	User defined			

To obtain the right results when these codes are printed you may need to create a printer driver; see Section Nine - The Printer Editor.

The codes are inserted into text with the following commands:

Underline (1) - ♦PU
Bold (2) - ♦PB
Extended Sequence (3) - ♦PX
Italic (4) - ♦PI
Subscript (5) - ♦PL
Superscript (6) - ♦PR
Alternative font (7) - ♦PA
User Defined (8) - ♦PE

These commands insert the corresponding highlight code at the current cursor position. Successive occurrences of a highlight code enable and disable the corresponding printer facility.

The effect of highlights 1, 2, 3, and 4 (underline, bold, extended sequences, and italic text styles) are displayed on the screen as underlined, bold, grey, and tiny characters respectively when the cursor is moved onto another slot. When the cursor is on the same slot, all highlight codes are displayed as the corresponding highlighted numbers Ito E.

Highlight characters are considered to be of zero width for formatting and justification.

Note: You can use **SPACE** to create an 'exact space' character. This may help to create continuous underlining of titles etc.

Insert Highlights - OPHI

Inserts a specified highlight number in the text at the cursor position. Gives the prompt

Highlight number

Typing in a number between 1 and 8, followed by ENTER, will insert the corresponding highlight code into the text.

Remove Highlights - OPHR

Removes all occurrences of a specified highlight number from a given marked block of text. Gives the prompt

Highlight number

Typing a number between 1 and 8 followed by ENTER will remove all occurrences of the corresponding highlight from the marked block.

Highlight Block - ♦PHB

Highlights all words within a marked block of text with a given highlight number. Gives the prompt

Highlight number

Typing a number between 1 and 8 will remove any existing highlights of the same number and highlight all words in the marked block with pairs of the specified highlight character. Because individual words are highlighted, reformatting the highlighted block of text will leave the selected text correctly highlighted, and text will be printed correctly even if the highlighted block extends over a page break.

Expression slots

Any slot in a PipeDream document can be designated as an expression slot, in which case the expression you type into it will be evaluated, and the result will be displayed in the corresponding position in the document.

An expression is entered by giving the Edit Expression command on the EDIT menu, or by typing $\Diamond X$. The cursor will then move to the editing line, at the top of the screen, until the expression is entered by typing [NTER].

Alternatively, if the Options Page **Text/Numbers** option is set to N, all entries are taken as expressions.

Expressions

Expressions can consist of numbers, functions performing operations on other expressions, references to other slots, or a combination of these combined by mathematical operators. Expressions can give a numerical result, a date, or a string of text. Illegal expressions will give an error as their result.

Numbers

Numbers can be expressed in normal notation, or scientific notation. For example,

1, -1.7632, 1.4e27, 0.001

All calculations are performed to an accuracy of nine decimal places and numbers may lie between 1e38 and 1e-38.

Strings

Strings are entered between double quotes, and may contain spaces. A slot reference to a text slot returns a string.

Slot references

The form of a slot reference is

column-label row-number

separated by optional spaces, where

column-label designates one of the 64 columns, A to Z, followed by AA to BN, and

row-number is from 1 to 32768.

Slot references are normally 'relative'; the reference will be updated if the position of the slot containing the reference changes relative to other slots.

Each half of the slot reference may be 'fixed' by preceding the column letter or the row number by a dollar sign. The possibilities are:

A1	normal reference		
\$A1	fixed column reference		
A\$1	fixed row reference		
\$A\$1	fixed column, fixed row		

The fixed part of a reference is not altered when copied with the Replicate or Copy commands on the BLOCKS menu, or when placed in a selection expression for the Save and Print commands on the FILES and PRINT menus respectively.

When a slot to which a slot reference refers is deleted, the slot reference is marked with a '%' sign to indicate that the reference is no longer valid. The expression containing the slot reference will display the Bad slot error message.

Specifying a block of slots - Ranges

You can perform some functions on a block of slots, specified by the top left-hand corner of the block followed by the bottom right-hand corner of the block.

For example

A2 D8

specifies all the slots in the block between columns A and D, and rows 2 and 8 inclusive.

In some cases the function only makes sense if the range is restricted to ■ single row (a 'row range') as in A1 D1, or a single column (a 'column range'), as in B8 B20.

Specifying several slots - Lists

Functions are available to count, choose from, or find the maximum or minimum of a list of elements. The elements in a list are separated by commas and can be simple slot references, or ranges. Each slot in a range is considered as a separate list element. For example,

13. B1 B5. C7.

is a list containing the 7 elements 13, B1, B2, B3, B4, B5, and C7.

Dates

Dates are entered in the format

DD.MM.YYYYY or MM.DD.YYYYY

depending on whether the Panel date-format setting is European or American.

Dates can be sorted into chronological order, and the functions DAY, MONTH, and YEAR can be used to extract the values of the date's day, month, and year respectively.

Operators

The following operators can be used within expressions

Arithmetic

The arithmetic operators take two numbers as operands.

+ add - subtract
* multiply / divide

multiplyraise to the power

Also, '+' and '-' may be used on date values. For example

12.10.1987 + 127

will return the date 127 days after 12 October 87, or 16.2.88, assuming that European date format has been selected.

Relational

The relational operators can compare dates, strings, and numbers. Both operands must be of the same type, and the result is a logical value of FALSE=0 and TRUE=1.

< less than = equal to
<= less than or equal to > greater than

When strings are being compared, the following wildcards (as in the Replace command) can be included in the second string:

^? matches any single character

^# matches any number of characters ^^ represents ^

Logical

The logical operators operate on numeric or logical values. Boolean FALSE is taken as zero, TRUE as non-zero.

& AND
! unary NOT

OR

Functions ABS Absolute value

ABS(number)

Returns the absolute positive value of the argument.

ACS Arc cosine

ACS(number)

Returns the arc cosine of the argument, in radians.

ASN Arc sine

ASN(number)

Returns the arc sine of the argument, in radians.

ATN Arc tangent

ATN(number)

Returns the arc tangent of the argument, in radians.

CHOOSE Choose element from list

CHOOSE(list)

Returns an element from the list, using the value of the first element as an index into the remaining elements. For example, if B4 contains 17.2.1987

CHOOSE (MONTH(B4), "jan", "feb", "mar", "apr")

gives the result feb.

COL Column

COL

The value of the column in which it is evaluated. Column A is 1, column B is 2, etc.

COS Cosine

COS(radians)

Returns the cosine of the argument.

COUNT Count the number of elements

COUNT(list)

Returns the number of non-blank slots in the list.

DAY Day of date DAY(date) Returns the day number of a date argument. For example, if slot A1 contains 17.3.1961, then DAY (A1) returns 17 Degrees from radians DEG DEG(radians) Converts the argument, taken in radians, into degrees. EXP Exponent EXP(number) Returns the constant e (2.71828184...) raised to the specified power. Conditional expression IF(boolean,then,else) If the value of the first argument is TRUE, ie non-zero, the function returns then; otherwise the function returns else. For example, if slot A1 contains -23. IF(A1<0."Debit","Credit")</pre> would return Debit. INDEX Index slot INDEX(column,row) Returns the evaluated expression or string found at coordinates column, row. For example, if A2 contained IF(100, "Debit", "Credit") INDEX(1,2)

would return Credit.

INT Integer part

INT(number)

Returns the integer part of the argument.

LN Logarithm to base e

LN(number)

Returns the natural logarithm, log. of the argument.

LOG Logarithm to base 10

LOG(number)

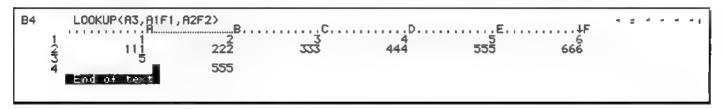
Returns the logarithm to base 10 of the argument.

LOOKUP Look up value in a table

LOOKUP(key,range1,range2)

Returns the value in range2 corresponding to the position that key occurs in range1.

key must be a cell reference. For example, the following sheet would result if LOOKUP(A3,A1 F1,A2 F2) were placed at B4:



If an exact match is found in range1, the function returns the value of the slot the same number of slots from the beginning of the second range.

If key is not found in range1, the function returns the error

Lookup

Wildcards '^?' and '^#' may be included in key.

MAX Maximum value in list

MAX(list)

Returns the maximum value from the slots in the list.

MIN Minimum value in list

MIN(list)

Returns the minimum value from the slots in the list.

MONTH Month of date

MONTH(date)

Returns the month number of its date argument.

For example, if A1 contains 12.6.1987 then MONTH(A1) returns 6.

PI π

PΙ

Returns the value 3.141592653.

RAD Radians from degrees

RAD(degrees)

Returns the argument, taken as degrees, converted into radians.

ROW Row

ROW

The value of the row in which it is evaluated.

SGN Sign

SGN(number)

Returns -1, 0, or 1 depending on whether the argument is negative, zero, or positive respectively.

SIN Sine

SIN(radians)

Returns the sine of the argument, in radians.

SOR Square root

SQR(number)

Returns the positive square-root of its argument.

SUM Sum

SUM(list)

Returns the sum of the slots in the list.

TAN Tangent

TAN(radians)

Returns the tangent of the argument, in radians.

YEAR Year of date

Returns the year number of its date argument.

For example, if A1 contains 12.6.1987 then YEAR(A1) returns 87.

@ Fields

You can include the page number, the date, the file title from the Options Page, or the value of any expression slot within text in your document using the special PipeDream @-fields.

The following @ fields are available:

Identifier	Effect
@P@	current page number
@D@	date
@T@	title defined in options page
@ref@	value of slot ref
<u>@</u>	@

One or more '@' characters should be given after the identifier to determine the size of the @ field for formatting. For example,

@P@@@@

creates ■ field of four characters. Provided the value to be displayed is less than the size of the @-field, the line will be justified correctly.

The field:

@ref@@@@@

will reserve five characters for the value of the slot indicated by the reference.

If it is an expression slot, the value will be displayed in the same format as in the slot itself, with alignment ignored.

When the cursor is not on a text slot with an @ field in it, the slot shows the value of the @ field. When the cursor is moved onto the slot, the actual @ identifier is shown, for editing.

Section Six

The Diary reference

The Diary application can be entered from the Index menu or from any application by typing DD. Only one copy of the Diary can exist in the list of SUSPENDED ACTIVITIES at any time.

The Diary displays the Diary page for the current date, or the page previously edited if there is one.



Text can be typed into the diary in a free format, and can be edited using similar cursor-editing facilities as in PipeDream. Text automatically wraps to the next line when it reaches the right-hand margin, but note that unlike PipeDream the Diary does not reformat the remaining text on the page. This is to avoid altering the layout of any subsequent diary entries on the same page.

The ESC key can be used to escape from any menu option.

If you call the Calendar from within the Diary, you can use the cursor keys to select a new date. Pressing ESC then returns you to the Diary which will now display the page for the new date selected. (See Using the Calendar and Diary together, p. 68, for details.)

Similarly, if you call the Alarm popdown from the Diary, the date will initially be set to the current date in the Diary. When you return to the Diary, however, the same date will be displayed on the screen as before the Alarm was called.

Memory low warning

When memory is low, a warning is displayed in the DIARY DATE window. You should then free memory before proceeding by deleting obselete diary entries with the �DEL command.

Operations on a block of text – BLOCKS



The commands on the **BLOCKS** menu allow you to perform a command on a block of text with a single operation A marked block can consist of a single line, can include several lines within one day, or can extend over several days, months, or even years.

To mark a block give the **Mark Block** command on a line to be selected, or at the top and bottom of an area to be selected. The marked block will be displayed highlighted on the screen.

Mark Block - ♦2

Marks a line, or the first and last lines in a block of lines, prior to performing one of the block operations on the entire block.

Clear Mark - ♦Q

Clears any marked block previously set up with the Mark Block command.

Copy - ♦BC

Makes a second copy of all the text within a marked block, putting the copy on the day indicated by the cursor position.

Move - ♦BM

Moves a marked block of text from one position in the Diary to the position indicated by the cursor.

Delete - OBD

Deletes a marked block of text from the Diary, closing up the gap. Note that this text cannot be recovered – the command should be used with caution.

List - OBL

Lists all or part of the diary to the screen, or to a printer.

The following options are displayed:

List on screen Yes
List on printer No
List only marked block Yes

Pressing Mill will list the entire Diary to the screen.

To list part of the Diary, mark the part you wish to list with the Mark Block command on the BLOCKS menu first.

When listing to the screen the Diary will pause at the end of each screenful with the PAGE WAIT display:

CONTINUE ESSU RESUME

Press the space bar to continue the listing or ESC to exit.

Searching and replacing

The Search and Replace commands allow you to search for information anywhere in the diary and, if you wish, replace it throughout by different text.

Whenever the Diary is performing a time-consuming task, such as searching through a huge amount of information, or performing a large number of replacements, the cursor will disappear.

Search - �BSE

Searches for a specified string, and moves to the day containing the first occurrence. You can restrict the search to a marked block, and also print or list all the lines which match the search string.

The following options are displayed:

----- STRING TO SEARCH FOR ------

For example, if you identify every expense claim in your diary with the prefix 'EX:', you could search for or print out all the expenses by entering EX: as the string to search for.

Equate upper and lower case: by default the case is ignored so that specifying the will find The THE, etc. Change to No to find only strings that match the case of the specified string exactly.

Search only marked block: change to Yes to restrict the search to a marked block.

Produce list / Print list: change to Yes to produce a list of the found strings to the screen or printer respectively. This is useful for finding and printing all lines beginning with the same word, such as Meeting.

Next Match - OBNM

Moves from the cursor position to the next occurrence of the string you are searching for.

Previous Match - ♦BPM

Moves from the cursor position to the previous occurrence of the string you are searching for.

Replace - ♦BRP

Allows you to replace each occurrence of a string you are searching for with other specified text. By default the case of the replaced string is altered to match the case of the string matched, and before each replacement you are asked whether you want to make it. You can restrict the replacements to a marked block.

Gives the prompts:

----- STRING TO SEARCH FOR -----

----- STRING TO REPLACE WITH ------

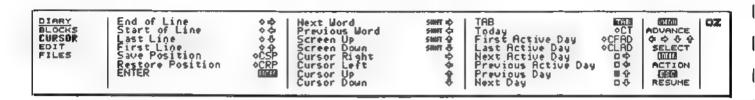
EQUATE UPPER AND LOWER CASE Yes ASK FOR CONFIRMATION Yes SEARCH ONLY MARKED BLOCK No

Replace with: specifies the string to replace every occurrence of the string to search for.

Equate upper & lower case: only affects the search part of the string, and the string is replaced exactly as specified.

The other options operate in the same way as for the Search command.

Moving around the Diary - CURSOR



The commands on the cursor menu enable you to move the cursor to any position on the page of information for the current day in the diary, and to the next or previous day.

TAB - TAB

Inserts spaces to position the cursor at the next tab position to the right. There are preset tab positions preset every 8 characters across the line.

ENTER - ENTER

Moves the cursor to the beginning of the next line.

Save Position - ♦CSP

Saves the current cursor position. If you move to a new position, you can jump back to the previous position with the **Restore Position** command. Up to five positions can be saved, and they will be restored in turn.

Restore Position - ♦CRP

Moves the cursor to the last position saved.

Moving within a line	Cursor Right - □		
	Moves the cursor one character space to the right.		
	Cursor Left - 🗘		
	Moves the cursor one character position to the left. You cannot move past the beginning of the line.		
	Next Word - SHFT □		
	Moves the cursor to the beginning of the next word on the current line.		
	Previous Word - SHET 🗘		
	Moves the cursor to the beginning of the previous word on the current line.		
	End of Line - ♦□		
	Moves the cursor to the character position after the last character on the current line.		
	Start of Line - ♦♦		
	Moves the cursor to the first character position in the current line.		
Moving within a day	Cursor Down - \mathbb{Q}		
	Moves the cursor down within the current day.		
	Cursor Up – 🛈		
	Moves the cursor up within the current day		

Last Line - ♦Ū

First Line - ♦û

Moves the cursor to the first line on the current page.

Moves the cursor to the last line on the current page.

Screen Down - SHET] 🗘

Moves the cursor down by a screenful of information.

Screen Up - SHIFT 1

Moves the cursor up by a screenful of information.

Moving between days

Today - OCT

Moves the cursor to today.

Next Day - □ □

Moves to the next day.

Previous day - □①

Moves to the previous day.

Active days

Days in the Diary which contain information are referred to as 'active' days. You can move rapidly between the active days with the Next and Previous Active Day commands, and you can find the latest and earliest information in the Diary with the Last and First Active Day commands.

If you call the Calendar from the Diary, active days, and the day you are currently looking at, are indicated by a marker against the day:

|4 ▶15 ||16

Next Active Day - □□

Moves to the next day containing an entry.

Previous Active Day - □ <

Moves to the previous day containing an entry.

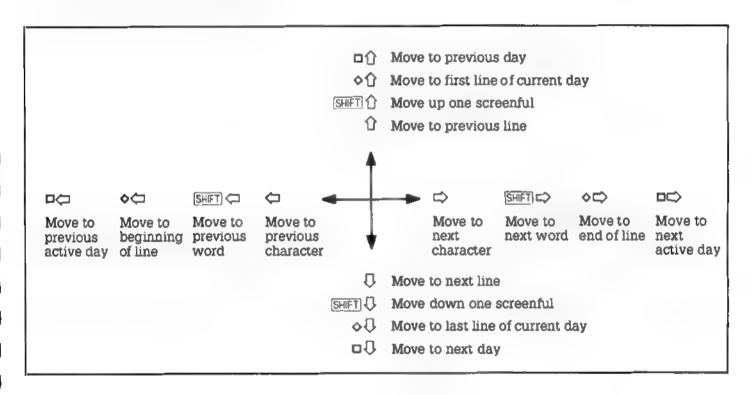
Last Active Day - ♦CLAD

Moves to the latest day containing any information.

First Active Day - ♦ CFAD

Moves to the earliest day containing any information.

Summary of Diary cursor operations



Editing the Diary – EDIT

DIARY BLOCKS CURSOR EDIT FILES	Rubout Delete Character Insert Character Delete Word Melete to End of Line Delete Line Insert Line	OG Swap Case OU Next Option OT Memory Free OY ON	◆U Split Line ◆S Join Lines ◆J ◆EMF	OESL ON OR OF SELECT ON O
--	--	--	--	--

Editing within a line

Insert/Overtype - ♦V

Switches the text entry mode between Insert mode, in which characters typed are inserted at the cursor position, and Overtype mode, in which characters type over the previous contents of the line.

The current mode is displayed at the right-hand side of the screen in the DIARY DATE window.

Delete Character - OG or SHIFT DEL

Deletes the character at the cursor position. All characters to the right of the cursor will move one position to the left to close up the gap.

Delete to End of Line - ♦D

Deletes the text from the cursor position to the end of the line.

Delete Word - ♦T

Deletes all characters from the cursor position to the beginning of the next word. If you position the cursor at the beginning of a word before giving this command, it will delete the word.

Rubout - 🕮

Deletes to the left. In Insert mode all characters at and to the right of the cursor will move left.

Insert Character – ♦U

Inserts a blank space at the cursor position.

Swap Case - ♦S

Changes the case of the character at the cursor position and moves the cursor to the next character.

Editing within a day

Delete Line - ♦Y or ♦DEL

Deletes the current line. Text on subsequent lines is moved up one line to close up the gap.

Join Lines - ♦EJL

Adds the text on the next line to the end of the text on the current line.

Insert Line - ♦N

Inserts a blank line at the cursor position. The text on the current line and all subsequent lines is moved down one line.

Split Line - ♦ESL

Splits the current line at the cursor position. All characters at, and to the right of the cursor, will be moved to the next line.

Miscellaneous

Memory Free – ♦EMF

Displays the amount of space available, in bytes, in the DIARY DATE window on the right-hand side of the Diary screen. Each byte represents the space needed for a character; approximately 2000 bytes are needed to store a typical A4 page of text.

Next Option - ♦J

Alternates between the available values of an option.

Loading and saving – FILES



The commands on the FILES menu allow you archive old information in the Diary, or to load a range of entries into the Diary, starting at a different date (such as a year later).

Load - OFL

Incorporates a diary file of a specified name into the information currently in the Diary.

Gives the prompts:

----- NAME OF FILE TO LOAD -----

START LOADING DATA AT DIARY DATE No

A block of Diary entries can be copied from one range of dates to another, such as from one year to the next, by saving the block, moving to the same date in the next year (using the Calendar), and then loading the data back with the option set

START LOADING DATA AT DIARY DATE Yes

Because loading appends data to whatever is already in the diary, an additional blank line will be present on the current day after a load.

Instead of typing the file name, the file can be selected from the Filer. After typing ⋄FL call the Filer by typing □F, and select the required file by marking it (see **Selecting files**, p. 83). When you return to the Diary from the Filer by pressing ESC the selected file name will have been

copied to the **Load** window. You will then just need to press ENTER to load the file.

Save - OFS

Saves the Diary to the current name, or to a name you specify. Normally the whole diary is saved. You can also save part of the Diary by marking the block of text first.

Gives the prompts:

----- NAME OF FILE TO SAVE -----

Section Seven Filer reference

This section describes the more advanced features of the Filer popdown, and should be read in conjunction with the Filer description in Section Three. The features described here include:

- Directories, and the hierarchical filing system
- The Command Line Interpreter, and CLI files

Specifying file names in full

The full form of a file name is

:DEVICE/DIRECTORY/DIRECTORY/ /filename

where DIRECTORY and filename are each of the form

name.extension

consisting of a *name* of up to 12 letters or digits, followed by an optional *extension* of up to three letters or digits,

The following extensions are used for system functions:

.sgn Fo

For □+K and □+S CLI files

.CLI For BOC

For BOOT.CLI; see **CLI files**, p. 179. For PipeDream multi-file List file

DIRECTORY is a directory name subject to the same constraints as

In addition the following symbols can be used:

../name

filename.

Parent directory of name

Current directory

Device specifications

DEVICE can be specified as one of the following:

Specification	Effect
:RAM.O	RAM in slot 0 (internal memory)
:RAM.1	RAM in slot 1 (external memory)
:RAM.2	RAM in slot 2 (external memory)
:RAM.3	RAM in slot 3 (external memory)
:RAM	Any RAM memory; ie 0, 1, 2, or 3. Used by CLI for temporary files, and lost on reset.
:ROM.O	ROM
:SCR.O	Screen
:PRT.0	Printer; via printer driver so that highlight codes are interpreted
:COM.0	Communications; via serial port
:INP.O	Standard input
:0UT.0	Standard output
:NUL.O	Null: absorbs output, and acts like an empty file on
	input

Note: RAM. – files must be deleted before a soft reset is performed with Operating Systems up to and including 3.0.

Wildcards

The device, directory and file name can contain the following wildcards:

*	Matches any number of characters (or none)
?	Matches a single character
//	Matches any number of directories (or none)

For example,

:*//letter doc* *.* /fred*	Finds the file called letter anywhere Finds: doc.tx, document, doc27, doc, etc. Finds only files with extensions. Finds all files beginning with fred in the parent
,,,,,	directory

Note that the characters '/' and '\' may be used interchangeably.

Additional Filer commands

The following commands provide facilities for creating directories, manipulating files within the hierarchical directory structure, and executing files of commands. The files referenced by commands such as **Select directory** or **Execute** can be selected by marking them; see **Selecting files**, p.83.

Catalogue Files Copy Rename Erase Execute Select First File Select Extra File Catalogue Files OCF OCD Select Directory Up Directory Oursor Right Cursor Left Cursor Up Cursor Down	Catalogue EPROM Save to EPROM Fetch from EPROM Select Device Tree Copy Name Match	OCE OES OFF OFF OFF OFF OFF OFF OFF OF
---	---	---

Select Directory - ♦SI

Sets the current directory to the specified directory. Gives the prompt

Name:

displaying the current directory string (if any).

For example, to set the current directory to directory TEXT in the current directory, specify

Name: TEXT

If the directory has not been created, a File not found error will be displayed.

Select Device - ♦SV

Sets the current device. Gives a prompt such as

Name: :RAM.0

showing the current device, which can be edited to the required new device.

The **Select Device** command resets the current directory to the root directory.

The Select Device and Select Directory commands affect the device and directory for the activity from which the Filer was entered, if there is

one. This allows different activities to use different devices and directories without the need for specifying them explicitly each time.

Note, therefore, that if you save files having set a device and/or directory from one activity, and then enter the Filer from another activity, the files may not appear in the DIRECTORY list. Check the directory displayed at the top of the DIRECTORY window to ensure that you are in the intended directory.

Down Directory - SHFT ↓ Up Directory - SHFT ↑

These commands are used for traversing a hierarchical directory structure. To select a directory move the highlight bar to the directory name in the Filer DIRECTORY window and press $\overline{\text{SHFT}}$ $\overline{\text{O}}$. To go back up to the parent directory press $\overline{\text{SHFT}}$ $\widehat{\text{O}}$.

Execute - \diamond EX

Executes a CLI file of commands specified after the prompt

Name: 🔳

See CLI files below.

Create Directory - ♦CD

Creates a directory within the current directory; the name is specified after the prompt

Name : 🔳

Tree Copy - ♦TC

Copies a file tree from one directory to another. Arguments to the Source and Destination fields must be devices or directories. For example,

Source : :RAM.1 Destination : :RAM.2

will make a duplicate copy of all files from RAM card 1 to RAM card 2.

The source area cannot be part of the destination area.

Name Match - ONM

Sets up a match string restricting access to files in the current directory to those that match the string. For example, setting

Name : *.bas

will catalogue only files with a bas extension. The default match string is *, matching all file names. When a name match other than * is active, the symbol nm will be displayed at the left-hand end of the Filer DIRECTORY window.

CLI files

The Filer Execute command, \diamond EX, allows a text file to be passed to the Command Line Interpreter, or CLI. The effect is as if the characters in the file had been typed at the Z88 keyboard. CLI files thus provide a means of specifying a sequence of commands or operations, which can then be carried out simply by executing the file. For example, an execute file could be used to carry out a frequently-used sequence of Replace operations in PipeDream documents.

Certain characters are given a special significance in CLI files, to allow special keys on the keyboard to be represented, or additional operations to be carried out by the Command Line Interpreter.

These special characters, and their functions, are as follows:

- # Prefixes a □ key sequence
- Prefixes a \diamond key sequence
- Used in combination with a letter to represent other special keys on the Z88 keyboard

As the first character on a line, introduces a special CLI command.

To represent these actual characters in a command file, they should be specified twice:

Sequence	Represents
##	#
~~	~
113	

Key sequences

Character	Significance
~A	Single press of the □ key; ~A~A has no effect
~C ~S ~I	Single press of the ♦ key; ~C~C has no effect
~S	SHIFT
~I	INDEX
~M	MENU
~H	HELP
~E ~X ~T	ENTER
~X	DEL
~T	(TAB)
~℧	$\overline{\Omega}$
~D	1
~L	\Box
~R	ightharpoonup
10	(ESC)

File control commands

The full-stop character introduces the following special commands when it is the first character of a line in an execute file.

Sequence	Significance
.T> filename	Create output file
.T< filename	Create input file
.T= filename	Create printer file
.> filename	Redirect output
.< filename	Redirect input
.= filename	Redirect printer
.D nnn	Delay nnn centiseconds
.s	Suspend CLI; all redirections of input or output remain in force
.* filename	Invoke new file to CLI
J	Ignore special significance of subsequent escape
	characters
.; a comment	Ignored.

The T character represents a 'T' junction, as it causes an additional copy of the input or output to be sent to a specified stream. For example:

.T>:RAM.O/fred.txt

sends a copy of what is going to the screen to the file

:RAM.O/fred.txt

The J character stands for 'Jam', as it inhibits interpretation of the escape characters.

Printer output can be spooled to a file with the '=' symbol. For example,

.= :RAM.O/printout

takes the text that would have been printed out, before printer codes are added, and puts the text into the file

:RAM.O/printout

Terminating execute files

When the CLI is running an execute file a CLI symbol is displayed in the OZ area of the screen. The current CLI can be terminated by pressing SHIFT [ESC]. If several CLIs are running they can all be terminated by holding down \diamond and pressing [ESC].

Redirecting keyboard input and screen output

The following key combinations can be used to redirect keyboard input and screen output:

Key □+P	Effect
D+P	All screen output also sent to the printer
D+S D+K	All screen output also sent to the file: RAM/S.sgn
D+K	Key input also sent to the file: RAM/K.sgn

For example, □+P can be used to obtain a catalogue of EPROM or RAM to a printer.

The corresponding sequences with '-' turn the facility off, and sequences $\Box +P$ and $\Box +S$ are mutually exclusive.

The commands $\square+S$ and $\square+K$ generate files K.sgn and S.sgn in temporary RAM. These should be deleted after use with the Filer Erase command.

Editing BASIC programs using PipeDream

BASIC programs are saved in a tokenised format, and so cannot be loaded into PipeDream and edited directly. However, the CLI provides a convenient way of obtaining a text listing of a BASIC program, which can then be edited and executed back into BASIC.

The procedure is as follows:

① LIST the program to the file : RAM. -/S.sgn by typing

LIST U+S ENTER

When the listing has finished, close the file by typing

m-S

The file: RAM. -/S.sgn can be loaded into PipeDream as plain text, and edited.

Add the characters

.J NEW

at the start of the file, and save it from PipeDream using the *Plain* text option.

Execute the edited file back into BASIC by entering BASIC and typing:

*CLI .*FILENAME

to invoke the CLI to execute the file.

When finished, erase the file: RAM.-/S.sgn using the Filer.

The .J at the start of the file avoids the need to replace characters such as # by ## throughout the BASIC program so that they will not be interpreted by the CLI.

Executing a file on reset

On resetting the Z88, if a file with the name

BOOT.CLI

exists on an EPROM card in slot 3, it will be copied into

:RAM.-/BOOT.CLI

and then executed. The file should be deleted when it is no longer required.

Section Eight The Terminal

The Terminal application provides a widely-used VT52 standard for communicating between a Z88 and another computer, or between two Z88 computers, over the RS232 serial line.

The Terminal can be entered from the Index APPLICATIONS menu, or by typing DV. You can leave the Terminal by pressing the SHFT and ENTER keys together.

Serial port settings

The serial port parameters can be configured from the panel which is entered with $\square S$; see Panel options, p. 87.

Control keys

The equivalent Z88 keys for the VT52 control keys are shown in the following table, together with a list of the codes transmitted:

VT52	Z 88	Codes sent
DELETE	(DEL)	\$7F
BACKSPACE	SHIFT DEL	\$08
UP	1	ESC A
DOWN	Û	ESC B
RIGHT	\Rightarrow	ESC C
LEFT	0	ESC D
FO	SHIFT (ESC P
F1	SHIFT -	ESC Q
F2	SHIFT U	ESC R
F3	SHIFT	ESC S
CONTROL	♦	_

These functions are provided on the Terminal COMMANDS menu, with the following additional command:

Exit - SHIFT ENTER

Removes the terminal and returns to the Index.

From the Index, **KILL** is preferred.

Spooling files

Material received by the Terminal application can be spooled to a file :RAM.-/S.sgn automatically by typing D+S before commencing the transfer. The file will be created in temporary RAM, and should be deleted after use.

Spooling can be disabled by typing \square -S.

Transmitting files

A convenient way of sending a file to a remote machine is to copy the file to the : COM device.

Enter the Terminal and establish contact with the remote machine in the usual way, and then type OF to go into the Filer.

Select the file you wish to transmit and then choose Copy from the Filer menu (see pp. 83-85 for details of how to select and copy files). A dialogue box will appear. Type in : COM as the destination and press ENTER. The file will then be transmitted.

Once the transmission is over the dialogue box will disappear leaving the Filer display on the screen. You may then press ESC to return to the Terminal.

Section Nine

The Printer Editor

With PipeDream you can create documents containing highlight codes that specify particular type styles and effects, such as bold and underlined text, superscripts and subscripts, and alternative fonts. Because different printers use different techniques to achieve these effects, the Z88 uses a printer driver to convert the standard PipeDream highlights to each particular printer's codes. The printer driver can then be altered to suit a particular printer's facilities.

The Z88 comes with a built-in driver, which interfaces with the widelyused Epson series of dot-matrix printers, or other printers compatible with this.

Creating a new printer driver

The Z88 PrinterEd application allows you to create your own printer driver definition, editing the options used by the built-in driver to add your own special printing effects to your documents.

Alternatively, you can design a printer driver definition for a make of printer not catered for by the built-in driver. To do this you will need to consult the printer handbook, to find out which codes are needed for each facility you want to use.

Having created a new printer driver definition, you can use this to replace the built-in driver with the **Update Driver** command.

To run the editor select PrinterEd from the Index APPLICATIONS list, or press DE from any application.

The driver definition is displayed on two pages. You can move between the pages with the following commands:

MIFT ↑ move from page 1 to page 2 move from page 2 to page 1.

While developing and testing a printer driver it is sensible to keep PrinterEd as a suspended activity. On completing a driver definition, and saving it to the filing system, the PrinterEd activity can be deleted from the Index with \Diamond KILL.

Editing the driver definition

The printer driver definition is altered by moving the cursor to the appropriate field on the page with the cursor keys, \bigcirc , \bigcirc , \bigcirc , or \bigcirc , and then typing the required value for the option. The editing commands are summarised on the PrinterEd CURSOR menu.

Some options take a Yes/No value; in this case you can toggle between the values with the **Next Option** command, $\diamond J$, or select the appropriate value by typing Y or N.

Most options take a list of one or more codes, separated by commas.

Code values

Printer codes can be entered in any of the following forms:

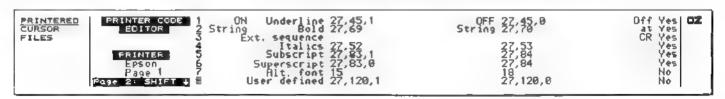
Type	Example 1	Example 2
Decimal number	90	27
Hexadecimal number	\$5A	\$1B
ASCII character	Z°	
ASCII symbol		ESC

The two examples show equivalent representations of the same values.

Any of the standard ASCII symbols can be used to represent the values 0 to 31, or \$0 to \$1F. A full list is given in Appendix D – Z88 Character Set.

Highlight codes

Page 1 of the PrinterEd application allows the behaviour of each of the eight PipeDream highlight codes to be specified.



The recommended assignment of highlight codes to printer functions is as follows:

Code	Function	Printed example
1	Underline	underlined_type
2	Bold	bold type
3	Extended sequence	éçπ
4	Italic	italic type
5	Subscript	н,о
6	Superscript	e=mc²
7	Alternative font	alternative font
8	User defined	

In every case the same highlight turns the facility off, and in all cases except 7 and 8, the facility is also turned off at the end of a slot.

The highlight table contains three columns specifying the following information for each of the eight highlights, 1 to 8:

ON String	The sequence of codes needed to turn the facility on
OFF String	The sequence of codes needed to turn the facility off
Off at CR	Yes or No, to determine whether the facility should be cancelled at the end of a slot.

You can move between columns using the cursor keys \Leftrightarrow and \Rightarrow , and between lines with \bigcirc and \bigcirc .

ON String and OFF String

The ON String specifies the sequence of codes to turn the corresponding printer facility on, and the OFF String the sequence of codes to turn it off. Each of these sequences of codes is output on alternate occurrences of the specified highlight code in the document.

If the facility is toggled on and off by the same sequence of codes, the OFF String can be omitted, and the ON String will be output on every occurrence of the highlight.

Overprinting

On some printers special effects can be obtained by outputting a sequence of codes for every character printed. For example, some daisywheel printers underline by backspacing, and then printing an underscore character, for every character printed.

You can set up highlights that work on this principle by including the special '?' character in the ON String. When the highlight is active, the specified ON String sequence will be output for every character printed, with '?' replaced by that character. This facility is toggled on and off by successive occurrences of the specified highlight code.

For example, to underline by backspacing and overprinting an underscore character, give the sequence

1 ON Underline ?,BS,"_"

If '?' occurs in the ON String the OFF String is ignored, and should be left blank.

Off at CR

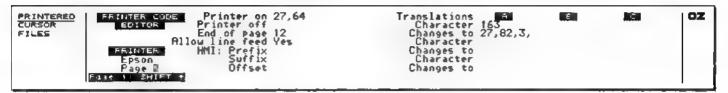
The final column specifies for each code whether the facility should be turned off automatically at the end of each slot. In general, all highlights which are normally inserted on a word by word basis, such as underlining and bold type, should specify Yes (the default) in this column.

Off at CR should also be set to Yes if the printer itself turns off the corresponding facility at a carriage return.

Off at CR should be set to No in the case of highlights, such as alternative font, which are applied to a large section of a document. Note that in this case headers and footers within the highlighted area will also be affected.

Printer options

Page 2 of the PrinterEd application allows the driver definition options to be specified, and up to nine character translations to be set up.



Printer on

Specifies a sequence of codes to be sent to the printer before printing a document. For example, the codes 27,64 in the Epson driver definition initialise the printer.

Printer off

Can be used to reset the printer to its previous settings so that subsequent printing will not be affected.

End of page

Specifies a sequence of codes to be sent to the printer at the end of each page. If the sequence contains a form-feed character, 12 (or FF), PipeDream will not output linefeeds to the end of page, resulting in faster and quieter page ejects on printers that support this.

Allow line feed

Determines whether a line feed code (LF) is sent at the end of each line, in addition to a carriage return (CR). This option is set to $Y \in S$ in the default Epson driver. If unwanted extra line feeds are produced, so that all printing is double-spaced, change the option value to No.

Note: With Operating Systems 3.0 and earlier, selecting No will cause ASCII 0 (NULL) to be sent instead of ASCII 10 (LF).

Microspacing - HMI

Certain printers allow the horizontal movement of the print head to be controlled to 1/120th of an inch, which mens that text will be justified

with an almost perfectly even distribution of the space. The following sample is printed without microspacing:

This sample of text demonstrates the improvement gained by justifying text with microspacing.

The same sample with microspacing is shown below:

This sample of text demonstrates the improvement gained by justifying text with microspacing.

Microspacing requires a Horizontal Motion Increment, or HMI, to be specified to the printer as the number of 120ths of an inch to be allocated to the printing of subsequent characters. This is normally given after a prefix code, although for some printers a suffix is also required. For example, the Ricoh, Flowriter 1600, and JUKI 6100 use the following prefix:

HMI prefix ESC,31 HMI suffix HMI offset 1

Translations

The character translation table allows up to 9 single-character substitutions to be made before printing, so that alterations can be made to the character set supplied by the printer. The sequence may include a string of codes, which will scroll within the window as they are entered.

For example, the default Epson driver uses the following sequence to print a '£' sign, assuming it is set up to use the USA character set:

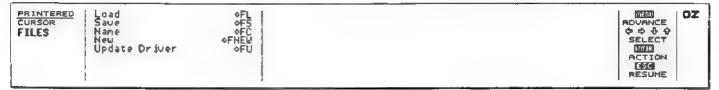
27,82,3,35,27,82,0

which is equivalent to:

ESC, "R", 3 select UK character set print pound sign estore USA character set

PrinterEd FILES menu

The PrinterEd FILES menu provides commands to allow driver definitions to be used for subsequent printing, or to be saved and loaded as named files. You can also reset the driver definition to the standard Epson driver.



The name of the current driver definition, initially Epson, is displayed on the Printer Editor screen and is shown for the PrinterEd activity in the Index YOUR REF. column.

Load - ♦FL

Allows a driver definition to be loaded into the Printer Editor. Gives the prompt:

Filename 🛮

Note that the driver definition is not actually installed until the **Update Driver** command is given.

Save - **\$FS**

Saves the current driver definition with a specified name.

Name - ♦FC

Sets the name of the current driver definition.

New - **\$FNEW**

Resets the driver definition in the Printer Editor to the options for the default Epson driver, and resets the driver used for printing to this driver.

Update Driver - ♦FU

Creates a printer driver from the definition currently in the Printer Editor, and installs it for use in subsequent printing.

Section Ten BBC BASIC

PipeDream can be used to carry out most of the operations you are likely to want to perform on text and numbers, such as entering and editing, searching, sorting and calculating. However, some problems would require you to carry out a sequence of different operations and this might be cumbersome and time-consuming using PipeDream. For this sort of problem you can turn to the BBC BASIC programming language which is provided in your Z88.

Programming languages are designed to allow you to instruct the computer to carry out a sequence of operations on text or numbers. BASIC is one such general-purpose programming language, and is the most widely used language on microcomputers. BASIC has a significant advantage over many other languages in that it is interactive: you can make changes to a sequence of instructions, and see the result immediately without having to perform any intervening operations. This means that programs can be developed relatively quickly.

This section provides a reference list of all the Z88 BBC BASIC language keywords. It is not intended as a tutorial on the BASIC language; many excellent books on this subject already exist.

The keywords are divided into four types:

Commands are instructions that can be typed from the keyboard to assist in creating a program, and testing it out. Commands are typed from the keyboard in immediate mode after the BASIC > sign prompt, and they may not be used within programs.

Statements are the special keywords that are used within programs, after a line number, to instruct the computer to do something. Most statements can also be typed directly after the BASIC prompt, and are then executed immediately so that you can try out their effect.

The BASIC statements are normally the first keyword after the line number in a program line.

Functions can be included in expressions, and will return the result of performing an operation on the arguments enclosed in brackets after their name. They are similar to the functions in PipeDream.

A function can be followed by one or more arguments, and returns a number or a string. Functions which take only one argument require brackets around the argument only if it is a complex expression. If the argument is a simple number, variable, or another function, no brackets are required.

Finally, the $\mbox{\bf operators}$ can be used to link the components of expressions.

The following keywords, associated with graphics, sound, and analogue operations in other versions of BBC BASIC, give the error

Sorry, not implemented

on the Z88:

Graphics: CLG, COLOUR, DRAW, GCOL, MODE, MOVE, PLOT, POINT

Sound: ENVELOPE, SOUND

Analogue: ADVAL

Entering BBC BASIC

You enter BBC BASIC by selecting BASIC from the Index APPLICATIONS LIST, or by typing □B from any application. The initial BASIC screen will then be displayed:

BBC BASIC (Z80) Version 3.00 (C) Copyright R.T.Russell 1987 OZ

CRES

In an unexpanded machine, BASIC has a workspace of 8K bytes. In an expanded machine, containing in slot 1 at least 128K RAM, the workspace is increased to 40K.

Entering keywords

Many keywords may be abbreviated when entered into a program, and will be expanded by the BASIC interpreter. In such cases the shortest abbreviation is shown in brackets after the full form; eg AUTO (AU.).

All keywords must be entered in capitals, as shown in the following alphabetical list. **Inverted Caps** mode can be selected by typing

<u>CAPSLOCK</u>. To give capital letters when the Z88 keys are typed alone, and lower-case letters when typed with the <u>SHIFT</u> key. Press <u>CAPSLOCK</u> to restore ordinary Caps mode.

Editing BASIC programs

The following program provides BBC BASIC on the Z88 with a line editor. The line editor works as follows:

① To edit a line you need to type: PROCE(line number) ENTER

The editor will list out the line and put the cursor at the end.

- You can now use the cursor keys to move within the line and make changes, and most of the edit commands available in PipeDream such as Delete Word etc.
- When you have made all the changes you want, press ENTER to store the line back in the program. If you want to abandon the changes you have made then press (ESC) and the line will be left unchanged.

Before you can use the editor you must type in the following program. You can then start writing your own program. When you save your program the editor will be saved with it.

	SAID	60100	
60000		60120	A=INKEY(O)
60010	DEF PROCE(B)	60130	A=OPENIN B\$
60020	REM Cambridge Computer Ltd.	60140	INPUT#A.A\$.A\$
60030	IF B=O THEN ENDPROC	60150	CLOSE#A
60040	A=OPENOUT": RAM.O/EE.CLI"	60160	A=OPENOUT B\$
60050	B\$=":RAM.O/E.CLI"	60170	PRINT#A,".J",A\$
60060	PRINT#A,".>"+B\$	60180	PTR#A=PTR#A-1
60070	PRINT#A,".J","LIST"+STR\$(B),"PROCF"	60190	BPUT#A.O
60080	CLOSE#A	60200	CLOSE#A
60090	*CLI .*:RAM.O/EE.CLI	60210	VDU 8
60100	ENDPROC	60220	OSCLI"*CLI .<"+B\$
60110	DEF PROCF	60230	ENDPROC

If you have several existing programs which you would like to append the editor to you must type the editor into PipeDream. On the first line you must include the CLI command J. Now save the file in plain text format as EDBAS. When you want to use the editor start a BASIC and load the program you want to edit. To append the editor onto the end of your program type:

```
*CLI .*EDBAS ENTER
```

where EDBAS should be in the directory selected by this application.

Note that if your program uses line numbers above 60000 you should renumber it first before appending the editor.

The editor generates two working files in :RAM.0 called /EE.CLI and /E.CLI. The files can be erased after use. If you have a RAM card in slot 1 or slot 2 you could alter the program to save its working files in :RAM.1 or :RAM.2 by changing lines: 60040, 60050, and 60090.

Printing from BASIC

The following program shows how to print from a BASIC program:

```
100 LET PRT_ON$=CHR$(5)+"["
110 LET PRT_OFF$=CHR$(5)+"]"
120 LET LF$=CHR$(10)
130:
140 LET PRT=OPENOUT":PRT"
150 IF PRT=O THEN PRINT" CAN'T OPEN PRINTER ":STOP
160:
170 PRINT#PRT_PRT_ON$
180 FOR I=1 TO 4
190 PRINT#PRT."Text "+STR$(I*PI)+" and numbers!"+LF$
200 NEXT I
210 PRINT#PRT_PRT_OFF$
220:
230 CLOSE#PRT
```

When run it prints the following:

```
Text 3.14159265 and numbers!
Text 6.28318531 and numbers!
Text 9.42477796 and numbers!
Text 12.5663706 and numbers!
```

BASIC keywords

ABS Absolute value (function)

Returns the absolute positive value of its argument.

ACS Arc cosine (function)

Returns the arc cosine of its argument in radians. The permitted range of the argument is -1 to +1.

For example,

PRINT DEG(ACS(0.5))

will print 60, because COS(60°) is 0.5.

AND (A.) Logical AND (operator)

Performs a bitwise logical AND between two operands which are internally converted to 4 byte integers before the operation.

It is normally used to join two conditions in an IF or UNTIL statement; thus

IF length >10 AND width > 10 THEN PRINT "OK"

ensures that a rectangle is larger than 10×10 .

ASC ASCII value (function)

Returns the ASCII character value of the first character of the argument string.

PRINT ASC("Z88")

gives 90, the ASCII value of "Z".

The brackets are optional, and ASC "", the null string, gives -1.

ASN Arc sine (function)

Returns the arc sine of its argument in radians. The permitted range of the argument is -1 to +1.

ATN Arc tangent (function)

Returns the arc tangent of its argument in radians.

AUTO (AU.) Automatic numbering (command)

Allows lines to be entered without first typing in the number of the line. The line numbers are preceded by the usual prompt (>).

By default the starting line number and increment are both 10, but they may optionally be specified; for example

AUTO 20

will start with line 20, and

AUTO 100, 20

will start at line 100 and increment by 20. AUTO will continue generating line numbers until you press [SC].

BGET# (B.#) Byte from data file (function)

Returns a byte from the data file whose channel number is its argument. The file pointer is incremented after the byte has been read. For example,

character=BGET#c

reads the next character from file c.

BPUT# (BP.#) Output a byte (statement)

Puts a byte to the data file whose channel number is the first argument. The second argument's least significant byte is written to the file. The file pointer is incremented after the byte has been written. Thus

BPUT#channel, char

writes char to file channel.

CALL (CA.) Call machine-code (statement)

Calls a machine code subroutine at a specified address, passing parameters in ■ parameter block addressed by the Z80's IX register. The IY register is set to the address of the machine code subroutine being called. The processor's A, B, C, D, E, F, H, and L registers are initialised to the least significant bytes of A%, B%, C%, D%, E%, F%, H%, and L% respectively.

This statement could cause corruption of the Z88 memory, and should therefore only be used by experienced programmers.

The parameter block contains the following list:

number of parameters	1 byte (IX+0)
first parameter type	1 byte (IX+1)
first parameter address	2 bytes (IX+2,IX+3)
parameter type) repeated as often
parameter address) as necessary

Parameter types

- 0 8 bit bytes (eg ?a)
 4 32 bit integer variable (eg !b or c%)
 5 40 bit floating point number (eg d)
- 5 40 bit floating point number (eg d)
 128 A string at a defined address (eg \$e terminated by a &0D)
- 129 A string variable such as f\$

In the case of a string variable the parameter address is the address of a String Information Block which gives the current length of the string, number of bytes allocated, and start address, in that order.

```
muldiv=1234
CALL muldiv.A.B$.C%
```

CHAIN (CH.) Load and run program (statement)

Loads and runs the program whose name is specified in the argument allowing one program to load another. Information can be passed between programs using the static variables @%, and A% to Z%.

CHR\$ ASCII character (function)

Returns the ASCII character string specified by the least significant byte of the numeric argument.

A\$=CHR\$(90)

will set A\$ to "Z", since ASC"Z" is 90. The characters corresponding to values 32 and above can be displayed on the screen with the line

FOR N%=32 TO 255: PRINT CHR\$(N%);: NEXT

CLEAR (CL.) Clear program (statement)

Clears all variables, including strings apart from the static variables @%, and A% to Z%.

CLOSE# (CL.#) Close channel (statement)

Closes a specified channel. For example,

CLOSE#c

closes channel c.

CLS Clear text area (statement)

Clears the text area of the screen. The text cursor is moved to the 'home' position (0,0) at the top left-hand character position of the text area.

COS Cosine (function)

Returns the cosine of its argument in radians.

X=COS(angle)

COUNT (COU.) Character count (function)

Returns the number of characters sent to the output stream (VDU or printer) since the last new line. For example,

PRINT A\$;:REPEAT PRINT ".";:UNTIL COUNT = 72

will pad the line with dots to 72 characters.

DATA (D.) Data (statement)

Introduces lists of data for use by the READ statement (see READ).

DEF Define function/procedure (statement)

Precedes declaration of a user-defined function (FN) or procedure (PROC). DEF must be used at the start of a program line.

For example,

DEF FNcelsius(f) = (f-32)*5/9

defines a function to convert Fahrenheit to Celsius. Executing

PRINT FNcelsius(98.4)

will convert 98.4 to Celsius.

DEG Degrees (function)

Returns the argument converted from radians to degrees. For example

PRINT=DEG(PI/2)

will print 90.

DELETE (DEL.) Delete lines (command)

Deletes a group of lines from the program. Both start and end lines of the group will be deleted. For example

DELETE 123,456

will delete all lines between 123 and 456 inclusive, which need not exist.

DIM Dimension array (statement)

Dimensions an array, or reserves an area of memory for special applications. For example,

DIM a\$(10,20)

dimensions a two-dimensional string array a\$ with elements a\$(0,0) up to a\$(10,20). Arrays may have one or more dimensions, and may be string arrays, floating-point arrays, or integer arrays.

DIM X%24

reserves 25 bytes and puts the address of byte 0 in the variable X%.

DIV Integer divide (operator)

Gives the integer quotient of two items. The result is always an integer.

X=A DIV 8
y=(top+bottom+1) DIV 2

ELSE (EL.) Else clause (statement)

An optional part of the IF...THEN, or ON...GOSUB/GOTO statements, it introduces the action to be taken if the testable condition evaluates to FALSE, or the ON expression is out of range.

END End program (statement)

Returns to direct mode.

ENDPROC End procedure (statement)

Denotes the end of a procedure defined with DEF PROC.

EOF# End of file (function)

Returns -1 (TRUE) if the end of the specified data file has been reached. For example,

REPEAT char%=BGET#data ... UNTIL EOF#data

will read characters until the end of the file whose channel number is the variable data.

EOR Logical Exclusive-OR (operator)

Performs a bitwise integer logical exclusive-or between two operands which are internally converted to 4 byte integers before the operation.

ERL Error line (function)

Returns the line number of the line where the last error occurred. For example,

PRINT "Error number" ERR "at line" ERL

ERR Error code (function)

Returns the error code number of the last error which occurred.

EVAL (EV.) Evaluate string (function)

Returns the result of evaluating the given expression supplied as a string. For example,

a=6 : b=7 PRINT EVAL ("a + b")

EXP Exponent (function)

Returns 'e' (2.71828183) to the power of the argument.

EXT# Extent of file (function)

Returns the total length of the file whose channel number is its argument.

The file must have been opened with OPENIN, OPENUP, or OPENOUT.

FALSE (FA.) False (function)

Returns the value zero representing logical false. For example,

REPEAT PRINT "*" : UNTIL FALSE

will continue forever.

FN Function (statement)

Introduces a user-declared function. The first character of the function name can be a letter, underline, or a number. No spaces are allowed between the function name and the opening bracket of the parameter list (if any).

FOR (F.) Start FOR loop (statement)

Initialises a FOR ... NEXT loop. The loop is executed at least once for each of the values of the control variable in the specified range.

FOR card=1 TO 6 PRINT card; NEXT card

will print

1 2 3 4 5 6

GET/GET\$ Wait for key (function)

Waits for a key to be pressed on the keyboard. GET returns the ASCII value, and GET\$ returns the corresponding single-character string. For example,

REPEAT UNTIL GET = 13

waits for ENTER! to be pressed.

GOSUB (GOS.) Call subroutine (statement)

Calls a section of a program as a subroutine at a specified line number. Control returns to the next statement when RETURN is encountered in the subroutine. One subroutine may call another subroutine (or itself).

10 GOSUB 400

20 END

400 PRINT"Hello": RETURN

GOTO (G.) Go to line (statement)

Transfers program control to a line with a specified or calculated line number. For example,

GOTO 100 GOTO (X*10)

The use of the calculated GOTO, as in the second example, is not recommended as it will not be renumbered correctly by the RENUMBER command.

HIMEM (H.) High memory bound (function)

A pseudo-variable which contains the address of the first byte of free memory.

IF Condition (statement)

Sets up a test condition which can be used to control the subsequent flow of the program. It is part of the IF ... THEN ...ELSE structure. The word THEN is optional under most circumstances.

IF length=5 THEN 110
IF A<C OR A>D GOTO 110
IF A>C AND C>-D THEN GOTO 110 ELSE PRINT "CCL"

INKEY/INKEY\$ Read key (function)

Waits for up to a specified number of clock ticks (10ms each). If no key is pressed in the time limit, INKEY will return -1 and INKEY\$ will return a null string; otherwise the INKEY function will return the ASCII value of the key pressed.

INPUT (I.) Input value (statement)

Inputs values from the keyboard.

The INPUT statement normally prints a ? prompt for each variable in the list. Alternatively strings can be included in the list of variables to be printed as prompts; omitting the comma after a string will suppress the question mark. For example:

INPUT"Enter your age: " age%, "and your name", name\$

INPUT LINE Input a line (statement)

Identical to INPUT except that the entire line, including commas, quotes and leading spaces is input into a string variable.

INPUT LINE AS

INPUT# Input from file (statement)

Reads data from a file into specified variables.

The data should have been written to the file with a corresponding PRINT# statement.

INSTR Substring (function)

Returns the position of a substring within a string, optionally starting the search at a specified place in the string. The leftmost character position is 1. If the sub-string is not found, 0 is returned.

For example,

PRINT INSTR("Z88","8")

will print 2, and

PRINT INSTR("PipeDream", "e", 5)

will start the search at character 5 and print 7.

INT Integer (function)

Converts a real number to the next lower or equal integer.

INT(99.8) is 99 INT(-12) is -12 INT(-12.1) is -13.

LEFT\$ Left of string (function)

Returns a specified number of characters from the left of a string. If there are insufficient characters in the source string, all the characters are returned.

Thus, if A\$="BANANA"

PRINT LEFT\$(A\$,3)

would print "BAN".

LEN Length of string (function)

Returns the length of the argument string. For example,

X=LEN"fred"

will set X to 4.

LET Assignment (statement)

Optional before an assignment statement.

LIST (L.) List program (command)

Lists the program.

Examples

LIST	lists the entire program
LIST .99	lists up to line 99
LIST 11,	lists from line 11 to the end
LIST 11,99	lists lines 11 to 99 inclusive
LIST 55	lists line 55 only

To obtain a listing of a program to a printer connected to the Z88:

- ① Attach and turn on the printer.
- ② Type LIST, type □+P, and press ENTER.
- ③ When finished, type □-P

LISTO LIST options (command)

Controls the appearance of a listed program. The number following the command specifies which of the following formatting options are required.

Value	Option
0	No inserted spaces
1	Space after line number
2	FOR NEXT loops indented
4	REPEAT UNTIL loops indented

The numbers can be added to combine options, the default being 7.

LN Natural logarithm (function)

Returns the natural (Naperian) logarithm of its argument.

LOAD (LO.) Load program (command)

Loads a new program from a file and clears the variables. For example

LOAD "STAT4" or LOAD ":RAM.O/CONVERTER.BAS"

LOCAL (LOC.) Local variables (statement)

Declares variables for local use inside a function (FN) or procedure (PROC).

LOCAL A\$, X, Y%

LOG Logarithm (function)

Returns the base-10 logarithm of its argument.

LOMEM (LOM.) Lower memory bound (function)

A pseudo-variable which controls where in memory the dynamic data structures are to be placed. The default is TOP, the first free address after the end of the program.

MID\$ Middle of string (function)

Returns a string consisting of a specified number of characters of the string starting from a given position. For example

A\$ = MID\$(B\$, start, length)

sets A\$ to the substring of B\$ starting at position 'start', and of length 'length'. If 'length' is omitted, or if there are insufficient characters in the string, then all the characters from 'start' onwards are returned. Thus

PRINT MID\$("DOZY",2,2)

will print

"0Z"

MOD Modulo (operator)

Gives the signed remainder of the integer division.

X=A MOD B

is equivalent to

X = A - ((A DIV B) *B)

NEW New program (command)

Initialises the interpreter for a new program to be typed in. An old program may be recovered with the OLD command provided no program lines have been typed in. The variables @% and A% to Z% are preserved even after a NEW command.

NEXT(N.) End FOR loop (statement)

Ends a FOR ... NEXT loop. NEXT takes an optional control variable; if this is not the same as the variable supplied in the corresponding FOR statement, an error will occur.

NOT Logical NOT (operator)

A unary operator (the same priority as unary –) giving a bit-by-bit binary inversion of the constant, variable, or mathematical or boolean expression to its right. Usually used in IF ... THEN or UNTIL statements to invert the sense of the condition. Expressions must be enclosed in brackets.

OLD Recover old program (command)

Undoes the effect of NEW provided no lines have been typed in or deleted, no variables have been created, and no popdown or application has been entered.

ON Multi-way switch (statement)

Provides a multi-way GOTO or GOSUB, depending on the value of a control variable. The line numbers in the list may be constants or calculated, and the unwanted ones are skipped without calculation. For example:

ON action GOSUB 1000,2000,3000,4000

ON ERROR Error trap (statement)

Provides error trapping. If an ON ERROR statement has been encountered, BASIC will transfer control to it (without taking any reporting action) when an error is detected. This allows error reporting/recovery to be controlled by the program. However, the program control stack is still cleared when the error is detected and it is not possible to return to the point where the error occurred.

Note that under some circumstances ON ERROR can cause BASIC to generate repeated errors, requiring a soft-reset. This can be avoided by including a call to INKEY\$, as in the following example, which will allow you to exit from BASIC to the Index and \$\infty\$KILL the activity:

10 ON ERROR REPORT: Q\$=INKEY\$(100) 20 ERROR

OPENIN (OP.) Open file for input (function)

Opens a file for reading or updating and returns the 'channel number' of the file, or 0 on failure. This number must be used in subsequent references to the file with BGET#, INPUT#, EXT#, PTR#, EOF# or CLOSE#.

OPENOUT Open file for output (function)

Opens a file for writing and returns the 'channel number' of the file, or 0 on failure. This number must be used in subsequent references to the file with BPUT#, PRINT#, EXT#, PTR# or CLOSE#.

X=OPENOUT(A\$)
X=OPENOUT(*;RAM.O/DATA.DAT*)

OPENUP (OPENU.) Open file for update (function)

Opens a file for update and returns the channel number, or 0 on failure. Once a file is opened you can update it or extend it.

OPT Assembler options (statement)

An assembler pseudo operation controlling the method of assembly.

It is followed by a number in the range 0 to 3 to specify the method of assembly:

Option	Action
0	errors suppressed, no listing
1	errors suppressed, listing
2	errors reported, no listing
3	errors reported, listing

The code is assembled into memory at the address specified by P%. For example:

```
10 DIM code 100
20 FOR pass = 0 TO 3 STEP 3
30 P%=code
40 [
50 OPT pass
60 ....
70 \ backslash introduces a comment
80 \ standard Z80 mnemonics are used
90 ]
100 NEXT pass
```

Alternatively the assembled code can be assembled into memory at the address specified by O%, with labels generated according to the value of P%, by adding 4 to each of these option values.

OR Logical OR (operator)

Gives the bitwise integer logical OR between two operands which are internally converted to 4 byte integers before the operation.

OSCLI Operating-system command (statement)

Allows a string expression to be passed to the operating system. For example, in the BASIC editor (see **Editing BASIC programs**, p. 197)

60220 OSCLI "*CLI.<" + B\$

PAGE (PA.) Program area (function)

A pseudo-variable controlling the starting address of the current user program area. The lower byte of PAGE is always zero.

PI Pi (function)

Returns 3.141592653.

POS Cursor position (function)

Returns the horizontal position of the cursor on the screen. The left-hand column is 0 and the right-hand column is one less than the width of the display.

PRINT (P.) Print text (statement)

Prints characters on the screen or printer.

Items may be separated by commas, semi-colons, or no separator:

PRINT "ONE" I% "TWO"

Numbers are printed in a format determined by the value of the variable @%. This is set to a hexadecimal value as follows:

@% = %SSNNPPWW

where

SS determines the format of strings created by STR\$.

If SS=01 then STR\$ will use the format specified by @%, otherwise @% will be ignored.

NN determines the notation format.

NN=00 General notation: integers will be printed with no decimal places, numbers between 0.1 and 1 will be printed as 0.1 etc, and numbers less than 0.1 will use scientific notation.

NN=01 Scientific notation: eq 100 is printed as 1E2.

NN=02 Fixed format notation: if the number will fit into the specified field width, it will be displayed with the number of decimal places specified by PP. Otherwise general notation will be used.

PP determines the number of decimal places to be printed.

WW determines the overall print field width.

By default, @% = &0000090A, giving general notation with a field width of 10 characters. Its value can be printed, in hexadecimal, with

PRINT ~@%

Numbers can be printed in hexadecimal by prefixing them with '~'.

PRINT# (P.#) Write to file (statement)

Writes the internal form of a list of variables, separated by commas, to a specified data file.

PROC Procedure (statement)

Introduces a user-declared procedure. The first character of a procedure name can be a letter, underline, or a number. No spaces are allowed between the procedure name and the opening bracket of the parameter list (if any). The procedure returns to the calling program with an ENDPROC statement.

PTR# File pointer (function)

A pseudo-variable allowing the random-access pointer of a specified file to be read and changed. For example,

PTR#F=PTR#F+5

moves to the next floating-point number in the file with channel number **F**, since 5 bytes are allocated to each number.

PUT Output to port (statement)

Outputs data to a Z80 port. Should only be used by experienced programmers as incorrect use could damage the Z88. The full Z80 extended addressing is available.

PUT A, N : REM output N to port A.

RAD Radians (function)

Returns its argument converted from degrees to radians. For example:

RAD(90)

READ Read DATA statements (statement)

Assigns to variables values read from the DATA statements in the program. Strings must be enclosed in double quotes if they have leading spaces or contain commas.

READ A%.B.C\$ DATA 27,-12.34,"Hello"

REM Comment (statement)

Introduces a comment, causing the rest of the line to be ignored.

RENUMBER (REN.) Renumber program (command)

Renumbers the lines and corrects the cross references inside a program. The options are as for AUTO.

REPEAT (REP.) REPEAT loop (statement)

Introduces a REPEAT...UNTIL loop. For example:

REPEAT PRINT "*"; UNTIL COUNT = 80

will print 80 stars on the screen or printer.

REPORT (REPO.) Report error (statement)

Prints out the error string associated with the last error which occurred. If no error has occurred, prints the copyright string.

RESTORE (RES.) Restore READ (statement)

Sets the line from which subsequent READ statements will read data.

RETURN (R.) Return from subroutine (statement)

Causes a RETURN to the statement after the most recent GOSUB statement.

RIGHT\$ Right of string (function)

Returns a specified number of characters from the right-hand end of a string. If there are insufficient characters in the string then all are returned. For example:

PRINT RIGHT\$("DOZY",3)

will print OZY.

RND Random number (function)

Returns a random number. The type and range of the number returned depends upon the optional parameter, as follows:

Value	Result of RND(X)
X<0	Returns X and resets random number generator to -X.
X=0	Repeats last random number given by RND(1).
X=1	Returns a random number between 0 and 0.999999.
X>1	Returns a random integer between 1 and X inclusive.

RUN Run program (statement)

Starts execution of the program after clearing all but the static variables @%, and A% to Z%.

SAVE (SA.) Save program (statement)

Saves the current program area to a file, in internal (tokenised) format.

SAVE "myprog.BAS" SAVE A\$

SGN Sign (function)

Returns -1, 0, or +1 depending on whether the argument is negative, zero or positive respectively.

result=SGN(answer)

SIN Sine (function)

Returns the sine of its argument taken in radians.

SPC Print spaces (statement)

Prints a specified number of spaces. SPC can only be used as part of an INPUT or PRINT list; for example:

PRINT "Name"; SPC(4); "Age"; SPC(6); "Address"

SOR Square root (function)

Returns the positive square root of its argument.

 $z=SQR(x^2+y^2)$

STEP (S.) FOR loop increment (statement)

Part of the FOR statement, this optional section specifies the step size. For example,

FOR i=1 TO 20 STEP 5 PRINT i; NEXT

will print: 1 6 11 16

STOP Stop program (statement)

Syntactically identical to END, STOP also prints a message

STOP at line X

where X is the line number.

STR\$ String (function)

Returns the string form of the numeric argument as it would have been printed. A number A% can be converted to a string in hexadecimal format with the function:

STR\$~A%

STRING\$ Repeat strings (function)

Returns a given number of repetitions of a string.

A\$=STRING\$(5,"HA")

will set A\$ to "HAHAHAHAHA".

TAB Move to screen position (statement)

Moves the cursor to a given screen position. TAB can only be used as part of a PRINT or INPUT statement.

There are two forms:

TAB(X) will print spaces until the cursor reaches column X (on the same line, or next line).

TAB(X,Y) will move the cursor directly to character position X,Y on the screen, where 0,0 corresponds to the top left-hand corner.

TAN (T.) Tangent (function)

Returns the tangent of its argument taken in radians.

THEN (TH.) Condition clause (statement)

An optional part of the IF ... THEN ... ELSE statement. It introduces the action to be taken if the testable condition evaluates to TRUE.

TIME (TI.) Time (function)

A pseudo-variable which sets and reads the elapsed time clock. The value of TIME must be initialised before it is used; for example

TIME=100

resets the value of TIME to 100 centiseconds, and

X=TIME

sets X to the value of the current elapsed time.

TIME\$ Time string (function)

Returns a string giving the current date and time; for example:

Wednesday 29 April 1987, 10:12:32

The functions LEFT\$, MID\$, and RIGHT\$ can be used to extract parts of this string. For example, the time alone can be obtained by

A\$ = RIGHT\$(TIME\$,8) PRINT A\$

10:12:32

TO Upper bound of FOR loop (statement)

Introduces the terminating value for the loop in a FOR ... TO ... STEP statement. When the loop control variable exceeds the value following "TO", the loop is terminated.

TOP Top of program (function)

Returns the value of the first free location after the end of the current program.

TRACE (TR.) Trace program (command)

TRACE can be used to provide information on the execution of a program. TRACE ON causes the interpreter to print executed line numbers when it encounters them, for debugging. The facility can be turned off by typing TRACE OFF.

TRUE True (function)

Returns the value -1, representing logical true.

UNTIL (U.) End REPEAT loop (statement)

The end of a REPEAT ... UNTIL structure.

USR Call machine-code (function)

Enters a machine code routine at the address specified in its argument, passing the least-significant bytes of the integer variables A%, B%, C%, D%, E%, F%, H%, L%, and F% into the correspondingly-named registers of the Z80 on entry.

Unlike CALL, USR returns a 32-bit result composed of the contents of the Z80's H, L, H', and L' registers, most-significant to least-significant.

This function should only be used by experienced programmers.

VAL Value of string (function)

Converts a character string representing a number into numeric form.

X=VAL(a\$)

VDU (V.) Output bytes to screen (statement)

Takes a list of numeric arguments and sends their least-significant bytes as characters to the current 'output stream'.

VPOS (VP.) Vertical position (function)

Returns the vertical cursor position. The top of the screen is line 0.

WIDTH (W.) Screen width (statement)

Controls output overall field width. Initially WIDTH is 94 (the default). For example, before printing it is a good idea to set

WIDTH 80

to give a new line after every 80 characters of output.

*CLI Send line to CLI (OZ command)

Sends a command to the command line interpreter. For example, in the BASIC editor (see **Editing BASIC programs**, p. 197):

60090 *CLI .*: RAM. O/EE. CLI

*ERASE Erase a file (OZ command)

Erases a specified file. For example,

*ERASE filename

or using the CLI

OSCLI "*ERASE "+file\$

*NAME Names the BASIC activity (OZ command)

Gives the BASIC activity a name, which will be displayed in the list of SUSPENDED ACTIVITIES in the Index.

*NAME MYPROG

•RENAME Rename a file (OZ command)

Renames a file; for example:

*RENAME oldfile newfile
OSCLI"*RENAME "+oldfile\$+" "+newfile\$

Special Z88 information

The following system information is available:

PRINT ~PTR# -1 The number of channels left for use and the ROM release number

PRINT EXT# -1 Prints the estimated free memory in bytes

PRINT EOF# -1 Returns 0 for an unexpanded Z88, and -1 for an expanded Z88 with at least 128K in slot 1

BASIC operators

The following operators may be used as part of expressions.

Arithmetic operators

The arithmetic operators take two numbers as operands.

- + add subtract
 * multiply / divide
- raise to the power

Relational operators

The relational operators can compare numbers, and return a logical value of FALSE=0 and TRUE=-1.

- < less than = equal to <= less than or equal to > greater than

Logical operators

The logical operators operate on numeric or logical values. Boolean FALSE is taken as zero, TRUE as -1:

Indirection operators

The following operators allow the programmer to access memory directly (called PEEK in other versions of BASIC) or to alter the contents of specified memory locations (called POKE in other BASICs).

These operators should only be used by experienced programmers, since they give the programmer the capability of altering the operation of other activities in the Z88 operating system; in general, only addresses within the region allocated by a BASIC DIM statement should be altered.

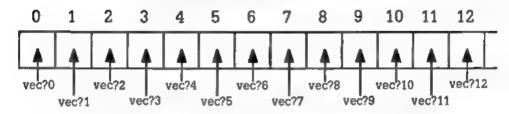
? byte indirection

- word indirection
- \$ string indirection

The usual way of using these operators is to allocate a vector using the DIM statement, and then manipulate elements of this vector with the indirection operators. For example,

DIM vec 15

allocates a vector of 16 bytes, and assigns its address to the variable vec. These bytes can be addressed as

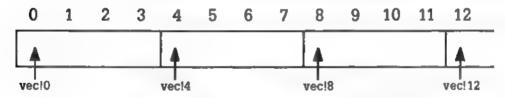


Note that ?vec is an alternative way of writing vec?0.

A typical manipulation might be

vec?1 = vec?1 + 1

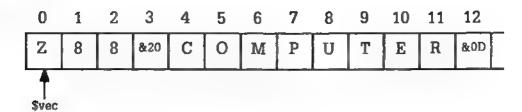
Alternatively the vector could be addressed as 4 four-byte words:



Finally, the string indirection operator allows a string to be stored directly into an area of memory. For example:

\$vec = "Z88 COMPUTER"

stores characters in the vector as follows:



The string can be accessed with the \$ operator, so the following statement will print the string:

PRINT \$vec

Individual characters can be accessed with the ? operator.

Order of precedence	The order o	f preceder	nce of the operators is as follows:
	Group 1	- () NOT	unary minus brackets logical NOT
	Group 2	٨	raise to the power
	Group 3	* /	multiply divide
	Group 4	+	add subtract
	Group 5	< = < = > < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = < > > = <	less than equal to less than or equal to greater than not equal to greater than or equal to
	Group 6	AND	Logical AND
	Group 7	OR EOR	Logical OR Logical Exclusive-OR
	so, for exan	nple, A-B*	C^D is equivalent to A–(B*(C^D)).

APPENDICES

Appendix A - Replacing batteries	229
Appendix B - Serial port	231
Appendix C – Error messages PipeDream error messages Diary error messages BASIC error messages	233 233 235 236
Appendix D – Z88 character set	237
Appendix E - PipeDream file format	240
Appendix F - Z88 specification	243
Index	245

Appendix A Replacing batteries

If the battery low symbol appears as soon as the Z88 is switched on, the safest course of action is to replace the batteries as soon as possible. The computer should be switched off until new batteries have been obtained.

The replacement batteries should be Alkaline cells, size AA, type MN1500 or LR6.

Note that while you are exchanging batteries, the contents of the machine's memory will be kept intact by the internal super capacitor. However, this will only maintain power for a limited time, so it is recommended that you power the Z88 from the mains power unit while changing batteries, especially if extra cards are fitted.

In the absence of a mains unit, carry out the following actions promptly, and bear in mind the time limitations given below.

Memory retention time

The time available depends on the number of RAM cards fitted. With no RAM cards the machine will retain its data for 3 minutes. With one RAM card this will be reduced to about 1 minute. Use of two RAM cards will lead to a further reduction to about 30 seconds.

It is not recommended that the machine be fitted with three RAM cards as this would require the use of slot 3 which is designed primarily for use with EPROM cards and, although it is possible to use it with RAM, a much higher power consumption would result.

The time limit does not depend on the size of RAM card used. EPROM cards do not affect the time limit in any slot.

The times given are for the worst case situation. In general the limit will be twice as high, but this should not be relied upon.

If you have a mains adaptor you can use it to power the Z88 while you change batteries.

Procedure

Read the following procedure carefully, so that you can carry it out without pausing:

- ① Remove the new batteries from their packaging, and place them within easy reach on the right-hand side of the Z88.
- Switch the Z88 off by pressing both SHIFT keys simultaneously.
- Place the Z88 keyboard-down, and remove the lid of the battery compartment.
- Note the time, and calculate how long you have according to the table given on the previous page.
- S Remove the four batteries from the battery compartment, if necessary tilting the Z88 to slide the batteries out.
- Throw the old batteries away, to avoid confusing them with the new replacements.
- Place one of the new batteries at each end of the battery compartment, observing the polarity carefully. Place the remaining two batteries in an 'A' shape, and press down on the point of the 'A' so that they pop into place.
- Check that the batteries are all orientated correctly. There is now no longer any time pressure.
- Replace the battery-compartment lid firmly before turning the machine over again.

DO NOT PRESS RESET.

Switch on, by pressing both SHFT keys simultaneously. The Z88 should now be working, and the battery-low indicator will not be displayed.

Appendix B Serial port

This appendix describes the pin connections for the Z88 serial connector.

The following connections are for a cable to connect the Z88 serial port connector to a 25-pin D-type serial printer connector, or equivalent:

288 9 w	ay 🏿 (Male)		Print 25 w	ter – ray D (Male)
1			-	
2	TxD	→	3	RxD
3	RxD	←	2	TxD
4	RTS	->	5	CTS
5	CTS	←	20	DTR
6	-		l -	
7	GND		7	GND
8	DCD	←	20	DTR
9_	DTR	→	6, 8	(DSR, DCD)

where the signals are as follows:

TxD	Transmitted data
RxD	Received data
RTS	Request to send
CTS	Clear to send
GND	Signal ground
DCD	Data carrier detect
DTR	Data terminal ready

Notes

The Z88 RS232 port is wired as Data Terminal Equipment

Pin 1 must not be used for RS232 signals. It carries +5v at $10\mu A$, even when the machine is OFF.

Do not use pin 6 on the Z88 connector.

Pin 9 is the RS232 DTR signal. It provides +5v at 1mA while the Z88 is switched on, for powering CMOS serial to parallel converters.

CTS on the Z88 must be high for the Z88 to transmit, and DCD must be high for the Z88 to receive. For simple RS232 use, connect pins 5 and \blacksquare to pin 9, and connect pins 2 (TxD), 3 (RxD), and 7 (GND) to the other computer.

A Suspended message will be displayed if a battery low is flagged while sending or receiving, or if the Z88 is switched off or the flap is opened. In this case you must repeat the transfer.

Appendix C Error messages

PipeDream		
Proeuream	error	messages

Bad number

Bad option

-ve root The argument to the SQR function was negative; eg SQR(-1).

All columns zero width Attempt to set the width of all columns to zero.

Bad argument to a Next Match (\$\Delta BNM) command was given with no prior Search command.

Bad column The Sort (\$BSO) command was given with an invalid column

specification.

Bad date

The argument to the DAY, MONTH, or YEAR function is not a valid

date; eg DAY(27).

Bad file The file specified was not a valid file.

Bad index A CHOOSE, or INDEX function was called with an invalid index; eg

CHOOSE(-2,1).

Bad list file The list file loaded by the Load command (OFL) does not contain valid

file names, or was not saved with the Save Plain text option.

Bad name The name specified in a Load, Save, or Name command was not a valid file name.

The argument to an Insert Highlights (\$PHI), Remove Highlights (\$PHR), Highlight Block (\$PHB), or Decimal Places (\$LDP) command

was not in the valid range.

The option was not valid for the command.

Bad range The range of slots specified in a Replicate or Save command was not a

valid range; eg,

Save only range of columns C A.

Bad slot The command was given an invalid slot reference; eg Go to Slot (\$CGS) A0.

Stack overflow

	The ^ sequence in a Search or Replace string was invalid; eg
	String to search for ^H
Divide by 0	An expression attempted to divide by zero; eg 2/0.
Edge	The block being copied or moved would not fit within the maximum possible sheet size; eg, an attempt to copy from A1 Z6 to AA1.
Editing expression	The specified command is not available while editing an expression; eg Load (\$\rightarrow FL).
End of list file	The end of the List file has been reached; eg Bottom File (\$FB) at the end of a document.
Escape	The ESC key was pressed while processing a document.
Exp range	The range of the EXP function was exceeded; eg EXP(100).
Expression too long	The string of text is too long to be entered into a slot; ie longer than 240 characters.
FP overflow	An expression resulted in a number too large to be represented; eg, 100^100.
Log range	The argument to the LOG function was invalid; eg LOG(-1).
Lookup	The LOOKUP function could not find a successful match.
Loop	Two slots containing string values reference each other.
Memory full	No more memory is available for the current sheet.
No list file	A multi-file command such as Bottom File (\$\sigma FB) was given with no List file loaded, or after the List file was cancelled due to an error.
No marked block	The command requires a marked block; eg Move.
Overlap	The source and destination blocks, specified in a Move or Copy command, overlap.
Propagated	The expression slot refers to another slot with an error.

The expression is too complex for evaluation.

Final message after Replace command.

In addition system error messages, such as 'File not found' are displayed

in another window on top of the operation being performed.

n Found

BASIC error messages	0	No room	24	EXP range
Didio citor messages	1	Out of range	26	No such variable
		_		
	2 3	Byte	27	Missing)
		Index	28	Bad hex
	4	Mistake	29	No such FN/PROC
	5	Missing	30	Bad call
	6 7	Type mismatch	31	Arguments
	7	No FN	32	No FOR
	8 9	\$ range	33	Can't match FOR
		Missing *	34	FOR variable
	10	Bad DIM	36	NoTO
	11	DIM space	38	No GOSUB
	12	Not LOCAL	39	ON syntax
	13	No PROC	40	ON range
	14	Array	41	No such line
	15	Subscript	42	Out of DATA
	16	Syntax error	43	No REPEAT
	17	Escape	220	Syntax
	18	Division by zero	222	Channel
	19	String too long	252	End of file
	20	Too big	252	Suspended
	21	-ve root	252	File not found
	22	LOG range	252	Read protected
	23	Accuracy lost	252	Write protected
	20	Accuracy lost	232	value protected

Appendix D **Z88 character set**

Hex 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 11 12 13 14 15 16 17 18 19	Dec 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25 26 26 27 27 27 27 27 27 27 27 27 27 27 27 27	Code NUL STXX EONCK BEST EFT FCR SILE10C3 NAYN ETT CR STB DC23 DC4 K STB CAM STB CAM STB CAM STB CAM STB	= ABCDEFGHIJKLMNOPQRSTUVWXY	Description Null Start of Heading Start of Text End of Text End of Transmit Enquiry Acknowledge Bell Backspace Horizontal Tab Line Feed Vertical Tab Form Feed Carriage Return Shift Out Shift In Data Line Escape X On Aux On X Off Aux Off Negative Acknowledge Synchronous File End of Transmitted Block Cancel End of Medium	Hex 20 21 22 23 24 25 26 27 28 29 2E 2D 2E 2D 33 34 35 36 37 38 39	Dec 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 55 56 57	Code !: #\$%&. () * + : / 0123456789	Description Space
14 15 16	20 21 22	DC4 NAK SYN	ΦT ΦU ΦV	Aux Off Negative Acknowledge Synchronous File	34 35 36	52 53 54	4 5 6	
18 19 1A	24 25 26	CAN EM SUB	⋄ X ⋄ Y ⋄ Z	Cancel End of Medium Substitute	38 39 3A	56 57 58	8	
18 10 10 1E 1F	27 28 29 30 31	ESC FS GS RS US	◊ [◊ \ ◊ f ◊ -	Escape File Separator Group Separator Record Separator Unit Separator	3B 3C 3D 3E 3F	59 60 61 62 63	; < = > ?	
1.	JI	42	•	omi ochmami	31	03	•	

	Hex 40 41 42 44 44 44 45 45 45 45 45 45 45 45 45 45	Dec 645 667 689 771 777 778 812 823 845 887 889 991 234 95	Code @ A I CDEFGHIJKLI OPQRSTUVWXYZ[\]^ -	Description	Hex 60 61 62 63 64 65 66 66 67 77 77 77 77 77 77 77 77 77 77	96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 123 124 125 126 127 160 163	Code o abcdefghijk1mnopqrstuvwxyz(**) ~ DEL	Delete Exact space Pound
--	---	---	--	-------------	---	---	--	--------------------------

Special characters

These are obtained by executing VDU 1, n from BASIC, where n is the number of the character.

Code	Character
32	Dot space
33	Alarm bell
39	Aposed '
42	Square
43	Diamond
45	Shift
224	'SPACE' sign (3 char)
225	'ENTER' sign (3 char)
226	'TAB' sign (3 char)
227	'DEL' sign (3 char)
228	'ESC' sign (3 char)
229	'MENU sign (3 char)
230	'INDEX' sign (3 char)
231	'HELP' sign (3 char)
240	Hollow left arrow
241	Hollow right arrow
242	Hollow down arrow
243	Hollow up arrow
244	Head arrow left
245	Head arrow right
246	Head arrow down
247	Head arrow up
248	Arrow left
249	Arrow right
250	Arrow down

Arrow up

251

Character modes

VDU	1.ASC"B"	Bold toggle
VDU	1. ASC"F"	Flash toggle
	1,ASC"G"	Grey toggle
VDU	1,ASC"R"	Reverse toggle
VDU	1,ASC"T"	Tiny font toggle
VDU	1.ASC"U"	Underline toggle

Appendix E PipeDream file format

The PipeDream file format is designed to facilitate manipulation by other programs. Apart from carriage return characters which are used as separators, no control characters or characters above 127 in value appear in the file (unless they have been explicitly typed in). The files are sequential, and can be edited by any text editor.

PipeDream constructs

Information about the structure of the file is stored in constructs consisting of one or more alphabetic characters between percent signs. Additional information relevant to the construct may be included before the final percent sign.

The file begins with a group of **Options Page constructs** giving the values of the Options Page parameters for the file. This is followed by the main body of the file.

Each column in the file is preceded by a **Column construct** giving details about the column, and followed by an entry for each slot in the column.

Each slot entry may include a collection of constructs giving details about the slot, and is terminated by a carriage return character.

Options Page construct

%OP%parameter value cr

parameter two characters identifying the parameter the value of the parameter

cr carriage return character

The various parameter values are:

AM Auto/manual BM Bottom margin

BO Borders DE Title

DP Decimal places

FM	Footer margin
FO	Footer
HE	Header
HM	Header margin
IW	Insert on wrap
JU	Justify
LM	Left margin
LP	Leading characters
LS	Line spacing
MB	Minus/brackets
PA	Pages
PL	Page length
PS	Page no. start
RC	Rows/columns
TM	Top margin
TN	Text/numbers
TP	Trailing characters
WR	Wrap

Column construct

%CO:column,width,wrap-width%

column	letter identifying the column
width	decimal number giving the column width
wrap-width	decimal number giving the wrap-width

These constructs can appear anywhere in the entry for each slot:

%B%	brackets format
%C%	centre align
%Dn%	decimal places, n gives the number
%DF%	floating format
%F%	free align
%Hn%	highlight character: n gives the number
%JL%	justify left
%JR%	justify right
%L%	left align
%LC%	leading character format
%LCR%	LCR align
%Pn%	page break: n gives the argument, 0 for unconditional

%PC% %R% percent character

%TC%

right align trailing character format

%V% slot is a number slot

General format:

construct text construct text ... cr

construct

one of the constructs above

text cr ASCII characters being the slot contents

carriage return character

Appendix F Z88 specification

Power source	4 x AA Alkaline Cells (M	IN1500, LR6) providin	a 20 hours of use
1 OTTEL BOULCE	TALLETTEMENTO COMO (10)	restood, tretol brostant	H no month or man

AC Mains adaptor (6.5 v DC ±10%), 500 mA, centre positive.

Weight 900 g (1.98 lb).

Dimensions 294 mm (L) x 210 mm (D) x 23 mm (H) $(11\frac{1}{2} \times 8\frac{1}{4} \times 7\frac{1}{6})$

Keyboard OWERTY, silent, 64 keys including INDEX, MENU, and HELP.

Sound Miniature loudspeaker, used for alarm or warning.

Serial I/O Port RS232, connector 9-way 'D' female.

Operating system Unique to Z88 (concurrent, 4M Bytes address range).

Operating temperature 0°C to 40°C (32°F to 104°F).

Microprocessor CMOS Z80

Internal memory RAM CMOS 32K Bytes

CMOS EPROM

ROM CMOS 128K Bytes

Memory cards Slots 1, 2, or 3 1M Byte per card maximum

Slot 3 also programs EPROM cards.

CMOS RAM Random Access Memory. Data retained while machine is powered.

Erasable, Programmable, Read-Only Memory

Data retention measured in years. Card can be removed from Z88 without data loss. Eraser available from Cambridge Computer Limited.

Index

^	Beginning of Line (PipeDream	CLI file-control commands 180
A	command) 115	CLI files, examples 182
ABS (BASIC keyword) 199	BGET# (BASIC keyword) 200	CLI key sequences 180
ABS (PipeDream function) 153	BLOCKS menu in PipeDream 104	Clock 13, 77
ACS (BASIC keyword) 199	Bold (PipeDream command) 148	CLOSE# (BASIC keyword) 202
ACS (PipeDream function) 153	Bottom File (PipeDream command)	
active days in the Diary 76		CLS (BASIC keyword) 202
Add Column (PipeDream command)	129	COL (PipeDream function) 154
123	Bottom of Column (PipeDream	column widths in PipeDream 131
Alarm 13, 78	command) 57, 116	columns in PipeDream 40
Align commands in PipeDream 42	BPUT# (BASIC keyword) 200	command-line interpreter 179
alignment commands in PipeDream		computer typeface 4
134	C	constants, in the Calculator 72
Alternative font (PipeDream		control keys, in Terminal 185
, <u>-</u>	Calculator 13	conventions 4
command) 148	functions 70	Copy (Diary command) 162
AND (BASIC keyword) 199	Calendar 13	Copy (Filer command) 85
application cards 98	used with Diary 68	Copy (PipeDream command) 108
applications 11	CALL (BASIC keyword) 201	copying blocks in PipeDream 108
entering 19, 93	CAPS LOCK key 17	COS (BASIC keyword) 202
ASC (BASIC keyword) 199	Caps mode 17	COS (PipeDream function) 154
ASN (BASIC keyword) 200	♦CARD 94	COUNT (BASIC keyword) 202
ASN (PipeDream function) 154	CARD command 94	COUNT (PipeDream function) 154
assembler 213	CARD error 95, 98	Create Directory (Filer command) 17
ATN (BASIC keyword) 200	cards	Cursor Down (Diary command) 167
ATN (PipeDream function) 154	errors 95	Cursor Down (PipeDream command)
AUTO (BASIC keyword) 200	installing 94	116
	Catalogue EPROM (Filer command)	Cursor Left (Diary command) 167
В	84	Cursor Left (PipeDream command)
D	Catalogue Files (Filer command) 84	115
BASIC 195	Centre Align (PipeDream command)	Cursor Right (Diary command) 167
error messages 236	42. 134	Cursor Right (PipeDream command)
programs, editing 182, 197	CHAIN (BASIC keyword) 201	115
running 196	characters, special 239	Cursor Up (Diary command) 167
basic concepts 15	CHOOSE (PipeDream function) 154	Cursor Up (PipeDream command) 11
batteries 6	CHR\$ (BASIC keyword) 202	cursor keys 16
inserting 7	CLEAR (BASIC keyword) 202	in PipeDream 38
replacing 229	Clear Mark (Diary command) 162	cursor operations
BBC BASIC 12, 195	*CLI 222	in PipeDream 117
	CLI 179	-
	OH 1/3	in the Diary 169

D	DIV (BASIC keyword) 204 Down Directory (Filer command) 178	Exit (Terminal command) 185
	Down Directory (Filer command) 178	EXP (BASIC keyword) 205 EXP (PipeDream function) 155
DATA (BASIC keyword) 203 data transfer 231	_	expression slots 36, 58, 150
database example 46	E	EXT# (BASIC keyword) 205
date format 88	EDIT menu in PipeDream 118	Extended Sequence (PipeDream
dates in PipeDream 152	Edit Expression (PipeDream	command) 148
DAY (PipeDream function) 155	command) 58	extensions, in file names 81
Decimal Places (PipeDream	Edit Expression (PipeDream	extensions, in the names of
command)	command) 123, 150	_
Decimal Places (PipeDream	editing expression slots in PipeDream	F
command) 136	123	FAIL error 95
DEF (BASIC keyword) 203	editing within a slot in PipeDream	FALSE (BASIC keyword) 205
Default Format (PipeDream	119	FCC compliance iii
command) 137	ELSE (BASIC keyword) 204	Fetch from EPROM (Filer command)
DEG (BASIC keyword) 203	END (BASIC keyword) 204	85
DEG (PipeDream function) 155	End of Line (Diary command) 167	File name, in PipeDream 125
DEL key 16	End of Line (PipeDream command)	file names 81
in PipeDream 38	115	full specification 175
DELETE (BASIC keyword) 203	ENDPROC (BASIC keyword) 204	Filer 13, 80
Delete (Diary command) 163	ENTER (Diary command) 166	Filer commands 83, 177
Delete (PipeDream command) 108	ENTER (PipeDream command) 116	Filer reference 175
Delete Character (PipeDream	ENTER key 16	FILES menu in PipeDream 125
command) 40, 119	in PipeDream 39	FILES menu in PrinterEd 193
Delete Column (PipeDream command)	EOF# (BASIC keyword) 204	finding information in PipeDream 52
121	EOR (BASIC keyword) 205	First Active Day (Diary command) 16
Delete Line (Diary command) 171	EPROM cards 96	First Column (PipeDream command)
Delete Row (PipeDream command)	EPROM eraser 97	57, 116
121	EPROMs, use with Filer 85	First Line (Diary command) 167
Delete Row in Column (PipeDream	*ERASE 222	Fix Column (PipeDream command)
command) 120	Erase (Filer command) 86	135
Delete to End of Line (Diary	ERL (BASIC keyword) 205	Fix Row (PipeDream command) 135
command) 170	ERR (BASIC keyword) 205	FN (BASIC keyword) 206
Delete to End of Slot (PipeDream	error messages	foot 7
command) 120	BASIC 236	footers in PipeDream 142
Delete Word (Diary command) 170	Diary 235	FOR (BASIC keyword) 206
Delete Word (PipeDream command)	PipeDream 233	Format Paragraph (PipeDream
119	ESC key 16	command) 120
device specification 176	Escape (PipeDream command) 124	format, PipeDream 240
devices 81	EVAL (BASIC keyword) 205	formatting in PipeDream 35, 121
Diary 12, 65	exact space 17, 121	Free Align (PipeDream command) 13
error messages 235	Execute (Filer command) 178, 179	functions in PipeDream 153
screen 65	executing a file on reset 183	FX800 printer 187
use with Calendar 68	executing a program from the Alarm	
DIM (BASIC keyword) 203	79	

G

GET/GET\$ (BASIC keyword) 206 Go to Slot (PipeDream command) 114 GOSUB (BASIC keyword) 206 GOTO (BASIC keyword) 207

H

ľ

L

t

hard reset 24
headers in PipeDream 142
headings, fixing 135
HELP key 16
help 25
hierarchical filing system 80
Highlight Block (PipeDream
command) 149
highlight codes 42, 148
in PrinterEd 188
highlight commands 41
highlighting text 148
HIMEM (BASIC keyword) 207
home expenses example 56

IF (BASIC keyword) 207

I

ì

IF (PipeDream function) 155 Import/Export 14, 90 protocol 91 INDEX (PipeDream function) 155 INDEX error 95 INDEX key 16 Index 13, 18 screen 18, 92 INKEY/INKEY\$ (BASIC keyword) 207 INPUT (BASIC keyword) 207 INPUT# (BASIC keyword) 208 INPUT LINE (BASIC keyword) 208 Insert Character (Diary command) 171 Insert Character (PipeDream command) 119 Insert Column (PipeDream command) 122

Insert Highlights (PipeDream command) 149 Insert Line (Diary command) 171 Insert Page (PipeDream command) 121 Insert Reference (PipeDream command) 123 Insert Row (PipeDream command) 41. 122 Insert Row in Column (PipeDream command) 120 insert mode in PipeDream 119 Insert/Overtype (Diary command) 170 Insert/Overtype (PipeDream command) 119 inserting a line in PipeDream 41 INSTR (BASIC keyword) 208

INT (BASIC keyword) 208

Inverted Caps mode 17

in BASIC 197

INT (PipeDream function) 156

Italic (PipeDream command) 148

J

jam sequence, in CLI 181 Join Lines (Diary command) 171 Join Lines (PipeDream command) 120

K

keyboard 15 keyboard options 87 keyboard, cleaning 17 keycap legends 5 ⋄KILL 20, 94 KILL 98

${f L}$

Last Active Day (Diary command) 168
Last Column (PipeDream command)
57, 116
Last Line (Diary command) 167
LAYOUT menu in PipeDream 131

layout, altering in PipeDream 42 LCR Align (PipeDream command) 134 Leading Characters (PipeDream command) 63, 136 Left Align (PipeDream command) 134 LEFT\$ (BASIC keyword) 208 LEN (BASIC keyword) 209 LET (BASIC keyword) 209 line editing 24 LIST (BASIC keyword) 209 List (Diary command) 163 list file 126, 128 LISTO (BASIC keyword) 209 lists in expression slots 152 LN (BASIC keyword) 210 LN (PipeDream function) 156 LOAD (BASIC keyword) 210 Load (Diary command) 172 Load (PipeDream command) 44, 126 loading a BASIC program 210 loading in PipeDream 44 LOCAL (BASIC keyword) 210 **LOCK OUT state 79** LOG (BASIC keyword) 210 LOG (PipeDream function) 156 LOMEM (BASIC keyword) 210 LOOKUP (PipeDream function) 156

M

Margin Left (PipeDream command)
132
Margin Right (PipeDream command)
132
margins in PipeDream 131, 142
Mark Block (Diary command) 162
Mark Block (PipeDream command) 50
marking blocks in PipeDream 50, 104
MAX (PipeDream function) 157
Memory Free (Diary command) 171
memory low 24
MENU key 16
menu, selecting 21
Microspace pitch (PipeDream
command) 147

NOT (BASIC keyword) 211

PRINT# (BASIC keyword) 215

PRINT menu in PipeDream 146

microspacing in PrinterEd 191	Number < > Text (PipeDream	options in commands 22, 103
MID\$ (BASIC keyword) 210	command) 124	OR (BASIC keyword) 214
MIN (PipeDream function) 157	number formats in PipeDream 63, 136	OSCLI (BASIC keyword) 214
MOD (BASIC keyword) 211		overprinting 189
MONTH (PipeDream function) 157	0	Overtype mode in PipeDream 38, 119
Move (Diary command) 162	O	OZ information 18
Move (PipeDream command) 108	OLD (BASIC keyword) 212	
moving around a PipeDream	ON (BASIC keyword) 212	P
document 57	ON ERROR (BASIC keyword) 212	F
moving between days in the Diary 66	OPENIN (BASIC keyword) 212	PAGE (BASIC keyword) 214
moving blocks in PipeDream 108	OPENOUT (BASIC keyword) 213	page breaks in PipeDream 122
moving in PipeDream 114	OPENUP (BASIC keyword) 213	page display map 33
moving within the Calendar 75	operations	Panel 14, 87
multi-column document, creating 132	executing 22	paragraphs in PipeDream 39
multi-file documents in PipeDream	selecting 22	party invitation example 37
126, 128, 147	operators	percentage calculations in the
multi-file example 129	in BASIC 223	Calculator 73
	in PipeDream 152	PI (BASIC keyword) 214
NT	precedence of 225	PI (PipeDream function) 157
N	OPT (BASIC keyword) 213	PipeDream 11
*NAME 222	OPTIONS menu in PipeDream 138	error messages 233
Name (PipeDream command) 126	Options Page (PipeDream command)	file format 240
Name (PrinterEd command) 193	46	reference 103
Name Match (Filer command) 179	Options Page 138	screen 32
name and address list example 46	Options Page in PipeDream 46	starting 32
NEW (BASIC keyword) 211	Options Page options	using 31
New (PipeDream command) 44, 113	Auto/Man 141	popdowns 11
New (PrinterEd command) 193	Borders 140	entering 19, 93
NEXT (BASIC keyword) 211	Columns/Rows 141	running 69
Next Active Day (Diary command) 168	Decimal places 141	using 69
Next Column (PipeDream command)	File 138	POS (BASIC keyword) 214
116	Free 139	Previous Active Day (Diary command)
Next Day (Diary command) 168	Insert on wrap 140	168
Next File (PipeDream command) 129	Insert/Overtype 139	Previous Column (PipeDream
Next Match (Diary command) 164	Justify 140	command) 116
Next Match (PipeDream command)	Lead chs. 141	Previous Day (Diary command) 168
53, 109	Line spacing 142	Previous File (PipeDream command)
Next Option (Diary command) 171	Microspace 139	129
Next Option (PipeDream command)	Minus/brackets 141	Previous Match (Diary command) 164
139	Page 139	Previous Word (Diary command) 167
Next Word (Diary command) 167	Page length 142	Previous Word (PipeDream command)
Next Word (PipeDream command) 115	Start page 142	115
NM in Filer DIRECTORY window. 179	Text/Numbers 140	PRINT (BASIC keyword) 214

Trail chs. 141

Wrap 140

Print (PipeDream command) 44, 53. Right Align (PipeDream command) 64. SGN (PipeDream function) 157 146 134 short cuts 23 RIGHT\$ (BASIC keyword) 217 Printer Editor 187 Sign Brackets (PipeDream command) printer driver 187 RND (BASIC keyword) 217 136 editing 188 ROM cards 98 Sign Minus (PipeDream command) 136 PrinterEd 12, 187 ROW (PipeDream function) 157 printing rows and columns in PipeDream 33 SIN (BASIC keyword) 218 expressions 124 RS232 connections 231 SIN (PipeDream function) 158 from BASIC 198 RS232 parameters 89 slot references 58 Rubout (Diary command) 170 slots in PipeDream 33 in PipeDream 44 Rubout (PipeDream command) 119 soft reset 24 selected rows in PipeDream 54 Sort (PipeDream command) 51, 108 PROC (BASIC keyword) 215 RUN (BASIC keyword) 217 PTR# (BASIC keyword) 215 sorting in PipeDream 50, 108 **OPURGE 94** SPC (BASIC keyword) 218 PUT (BASIC keyword) 216 specification of Z88 243 SAVE (BASIC keyword) 218 Split Line (Diary command) 171 Split Line (PipeDream command) 120 Save (Diary command) 173 R Save (PipeDream command) 43, 127 spooling files from the Terminal 186 RAD (BASIC keyword) 216 Save (PrinterEd command) 193 spreadsheet example 56 RAD (PipeDream function) 157 Save Position (Diary command) 166 SQR (BASIC keyword) 218 RAM cards 95 Save Position (PipeDream command) SQR (PipeDream function) 158 Start of Line (Diary command) 167 ranges in expression slots 151 READ (BASIC keyword) 216 Save to EPROM (Filer command) 84 STEP (BASIC keyword) 218 Recalculate (PipeDream command) saving a BASIC program 218 STOP (BASIC keyword) 219 saving a document in PipeDream 43 113 STR\$ (BASIC keyword) 219 redirecting input and output 181 Screen Down (Diary command) 168 STRING\$ (BASIC keyword) 219 REM (BASIC keyword) 216 Screen Down (PipeDream command) styles, adding to text 41 Remove Highlights (PipeDream 116 Subscript (PipeDream command) 148 Screen Up (Diary command) 168 command) 149 SUM (PipeDream function) 158 *RENAME 222 Screen Up (PipeDream command) 116 Superscript (PipeDream command) Rename (Filer command) 85 Search (Diary command) 67, 163 148 RENUMBER (BASIC keyword) 216 Search (PipeDream command) 52, 109 suspended activities 20, 93 REPEAT (BASIC keyword) 216 searching for a day in the Calendar 76 Swap Case (Diary command) 171 Replace (Diary command) 164 searching for Diary entries 67 Swap Case (PipeDream command) Replace (PipeDream command) 109 Select Device (Filer command) 96, 177 120 Replicate (PipeDream command) 59 Select Directory (Filer command) 177 switching off 10 Select Extra File (Filer command) 83 replicating slots 59 switching on 8, 10 REPORT (BASIC keyword) 217 Select First File (Filer command) 83 system information 222 reset 24 selecting files 83 serial port 231 reset button 8 RESTORE (BASIC keyword) 217 serial port parameters 89 Set Margin (PipeDream command) Restore Position (Diary command) 166 T junction escape sequence 180 Restore Position (PipeDream 132 TAB (BASIC keyword) 219 command) 115 setting an alarm 78 TAB (Diary command) 166 RETURN (BASIC keyword) 217 SGN (BASIC keyword) 218 TAB key 16

TAN (BASIC keyword) 219 TAN (PipeDream function) 158 Terminal 12, 185 text slots 35 THEN (BASIC keyword) 219 TIME (BASIC keyword) 220 TIME\$ (BASIC keyword) 220 title in PipeDream 144 TO (BASIC keyword) 220 Today (Diary command) 168 TOP (BASIC keyword) 220 Top File (PipeDream command) 129 Top of Column (PipeDream command) 57, 116 TRACE (BASIC keyword) 220 Trailing Characters (PipeDream command) 63, 136 translating codes in PrinterEd 192 Tree Copy (Filer command) 178 TRUE (BASIC keyword) 221 tutorial section 27 typing text in PipeDream 37

U

Underline (PipeDream command) 148
units conversion in the Calculator 74
UNTIL (BASIC keyword) 221
Up Directory (Filer command) 178
Update Driver (PrinterEd command)
187, 193
User Defined (PipeDream command)

User Defined (PipeDream command) 148

USR (BASIC keyword) 221

V

VAL (BASIC keyword) 221 VDU (BASIC keyword) 221 vectors in BASIC 224 VPOS (BASIC keyword) 221

W

WIDTH (BASIC keyword) 221 Width (PipeDream command) 47, 54, 131 wildcards
in Filer 176
in PipeDream 53, 110
Word Count (PipeDream command)
113
word wrap in PipeDream 38
word processing example 37

Y

YEAR (PipeDream function) 158

Z

Z80 assembler 213 Z88 character set 237 Z88 ROM release number 222 Z88 specification 243

^# in PipeDream 53 ^# wild field 111 ^? in PipeDream 53 ^? wild field 111

